UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

OCT 31 1991

MEMORANDUM FOR: Distribution*

FROM: for Don Joe P. Clem
Chief, Plans and Regulations Division

SUBJECT: Amendment 22 to the FMP for Groundfish of the Gulf of Alaska and Amendment 17 to the FMP for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area

Attached is a copy of the subject amendments and associated documents prepared by the North Pacific Fishery Management Council for formal review.

The subject amendments would implement the following measures: (1) a new management subarea in the Bering Sea and Aleutian Islands Area; (2) area closures around walrus haulouts in the Bering Sea and Aleutian Islands, (3) removal of statistical area 68 in the Gulf of Alaska, and (4) authorize experimental fishing permits in the Gulf of Alaska and the Bering Sea and Aleutian Islands.

Please provide your comments by November 29, 1991. If you have any questions, call Don Leedy at (301) 427-2341.

Attachment

*Distribution

F/CM
F/CM1 - Fricke, Surdi
F/CM2 - Clem, Miller
F/CM3 - Parsons
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F/BP - Oliver
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CS/EC - Cottingham
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OGC - Malone
OMB - Minsk
GCEL - Kuruc
GC - Johnson
F/PR3 - Hall
F/PR2 - Karnella

AMENDMENT 22
REVISIONS TO THE FISHERY MANAGEMENT PLAN FOR GROUNDFISH OF THE GULF OF ALASKA

On page 3-1, section 3.0, AREAS AND STOCKS INVOLVED, the second paragraph is amended, starting with the third sentence, to read as follows:

> "... For purposes of managing sablefish and rockfish stocks, the Eastern Regulatory Area is divided into two districts: West Yakutat (140° - 147° W. longitudes) and Southeast Outside (132°40' - 140° W.longitudes and north of 54°30' N. latitude). This division is intended to protect localized sablefish and demersal shelf rockfish stocks and is necessary to prevent overexploitation in the Eastern Regulatory Area. "

On page 3-2, Figure 3.1 "Regulatory Areas of the Gulf of Alaska FMP" is revised to show the two regulatory districts of the Eastern Regulatory Area.

On page 4-20, section 4.3, CONVENTIONAL MEASURES, a new subsection is added to read as follows:

4.3.1.6 Experimental fishing permits. The Regional Director, after consulting with the Director of the Alaska Fishery Science Center, and with the Council may authorize for limited experimental purposes, the target or incidental harvest of groundfish that would otherwise be prohibited. Experimental fishing permits might be issued for fishing in areas closed to directed fishing, continued fishing with gear otherwise prohibited, or continued fishing for species for which the quota has been reached. Experimental fishing permits will be issued by means of procedures contained in regulations.

As well as other information required by regulations, each application for an experimental fishing permit must provide the following information: Experimental design, e.g. staffing and sampling procedures, the data and samples to be collected, and analysis of the data and samples, and provision for public release of all obtained information, and submission of interim and final reports.

The Regional Director may deny an experimental fishing permit for reasons contained in regulations, including a finding that:

> (i) according to the best scientific information available, the harvest to be conducted under the permit would detrimentally affect living marine resources, including marine mammals and birds, and their habitat in a significant way.; or
> (ii) Issuance of the experimental fishing permit would inequitably allocate fishing privileges among domestic fishermen or would have economic allocation as its sole purpose; or
> (iii) Activities to be conducted under the experimental fishing permit would be inconsistent with the intent of the management objectives of the FMP; or
> (iv) The applicant has failed to demonstrate a valid justification for the permit; or
> (vi) The activity proposed under the experimental fishing permit could create a significant enforcement problem; or
> (vii) The applicant failed to make available to the public information that had been obtained under a previously issued experimental fishing permit.

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ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW/ INITIAL REGULATORY FLEXIBILITY ANALYSIS

FOR
AMENDMENT 17
TO THE FISHERY MANAGEMENT PLAN FOR
THE GROUNDFISH FISHERY OF THE BERING SEA AND ALEUTIAN ISLANDS AREA AND
AMENDMENT 22
TO THE FISHERY MANAGEMENT PLAN FOR
GROUNDFISH OF THE GULF OF ALASKA

AND FOR
A REGULATORY AMENDMENT TO DEFINE GROUNDFISH POTS

Prepared by Members of the Plan Teams
for the Groundfish Fisheries
of the Bering Sea and Aleutian Islands Area and the Gulf of Alaska,
and by staffs of the North Pacific Fishery Management Council,
National Marine Fisheries Service, Alaska Department of Fish and Game/
U.S. Fish and Wildlife/LGL Research Associates

Anchorage, Alaska

May 14, 1991

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SUMMARY OF AMENDMENTS 17 AND 22 TO THE GROUNDFISH FISHERY MANAGEMENT PLANS FOR THE BERING SEA AND ALEUTIAN ISLANDS AND THE GULF OF ALASKA

As part of the annual July/June plan amendment cycle for the Bering Sea/Aleutian Islands (BSAI) and the Gulf of Alaska (GOA) groundfish fishery management plans (FMPs), the North Pacific Fishery Management Council (Council) reviews proposed changes submitted by the public and management agencies. Upon recommendations of the Plan Amendment Advisory Group, the Advisory Panel, and the Scientific and Statistical Committee, the Council forwards the proposals that merit further consideration to the Plan Teams following the September Council meeting. The Plan Teams prepare a draft amendment package, including a draft environmental assessment/regulatory impact review/initial regulatory flexibility analysis (EA/RIR/IRFA).

The Council considers the appropriateness of the draft EA/RIR/IRFA) at its April meeting and instructs Council staff to submit it for public review. At its June meeting, the Council reviews public comments received and recommends which parts of the amendment package should be submitted to the Secretary of Commerce for approval and implementation.

At its September 1990 meeting, the Council selected five amendments and requested participating staff to prepare draft analyses for each amendment such that the Council would have them for review at its April 23-26, 1991 meeting. Analyses are provided herein for each amendment with two exceptions.

First, a proposed amendment to establish a biennial cycle for Stock Assessment and Fishery Evaluation (SAFE) Reports and for the FMP amendment cycle itself was not analyzed. The analysis was not done upon receiving NMFS advice that the "602 regulations" require SAFE reports to be reviewed annually, suggesting that SAFE Reports would likely be amended anyway after the annual review. Also, Council Standard Operating Procedures should be the vehicle to stipulate a biennial amendment cycle, obviating the need to include a biennial amendment cycle in the FMPs.

Second, a proposed amendment to require reporting of all fish retained in a groundfish fishery was not analyzed. This proposal was intended to provide NMFS the means through recordkeeping requirements to measure all fish and fish products on board a vessel for purposes of enforcing the directed fishing definition. The analysis was not done upon the advise of NMFS that NMFS is already able to make such measurements even without additional recordkeeping requirements.

At its April 1991 meeting, the Council considered draft analyses for three amendments included herein. The Council considered two other measures as well. First, an FMP amendment to establish the Bogoslof District in the BSAI for purposes of managing pollock is proposed, which follows up an emergency rule that was in effect during early 1991. Second, a regulatory amendment is proposed by the Alaska Department of Fish and Game to define a groundfish pot differently from a king or Tanner crab pot. Draft analyses for these two measures are included in this EA/RIR/IRFA. The Council approved each analysis and directed Council staff to release the draft EA/RIR/IRFA for Amendment 17/22 to the public for review. Final Council action is scheduled for the June Council meeting. Description summaries of these proposals follow:

1. Authorize experimental fishing permits:

An FMP amendment is proposed whereby the Regional Director, in consultation with the Council and Alaska Fishery Science Center, may issue experimental fishing permits to persons for purposes of obtaining information necessary to promote fishery conservation and management of the fisheries.

2. Establish Walrus Islands groundfish fishing closures:

An FMP amendment is proposed which would institute protective measures for the Walrus Islands in northern Bristol Bay. The 12-mile buffer zone created in 1989 will expire at the end of 1991.

3. Rescind GOA statistical area 68:

An FMP amendment is proposed to delete statistical area 68 (East Yakutat District), because it is not needed for fishery conservation and management and is imposing, therefore, unnecessary recordkeeping and reporting costs.

4. Establish the Bogoslof District:

An FMP amendment is proposed which would create a separate statistical subarea around the area of Bogoslof Island. This measure would allow for the establishment of a separate Total Allowable Catch (TAC) for pollock in this subarea.

5. Definition of a groundfish pot:

A regulatory amendment is proposed that would define a groundfish pot to differentiate it from king crab and Tanner crab pots.

1.0 INTRODUCTION

The domestic and joint venture groundfish fisheries in the exclusive economic zone (3-200 miles offshore) of the Gulf of Alaska and the Bering Sea/Aleutian Islands are managed under the Fishery Management Plans (FMPs) for Groundfish of the Gulf of Alaska and the Groundfish Fishery of the Bering Sea/Aleutian Islands. These FMPs were developed by the North Pacific Fishery Management Council (Council) under the Magnuson Fishery Conservation and Management Act (Magnuson Act).

The GOA FMP was approved by the Secretary of Commerce (Secretary) and became effective on December 1, 1978 (43 FR 52709, November 14, 1978) It is implemented by Federal regulations appearing at 50 CFR Parts 611, 620, and 672. Nineteen amendments to the GOA FMP have been approved by the Secretary. Amendment 19 (sablefish effort limitation measures) and 20 (inshore-offshore allocations) are currently being prepared by the Council.

The BSAI FMP was approved by the Secretary and became effective on January 1, 1982 (46 FR 63295, December 31, 1981) and is implemented by Federal regulations appearing at 50 CFR Parts 611, 620, and 675. Amendments 1-5, 7-13, and 16 have been approved by the Secretary. Amendment 16a is currently being reviewed by the Secretary. Amendment 6 was adopted by the Council but was disapproved by the Secretary. Amendment 14 (sablefish effort limitation measures) and 15 (inshore-offshore allocations) are currently being prepared by the Council.

1.2 Purpose of the Document

This document provides background information and assessments necessary for the Secretary of Commerce to determine that the FMP amendments are consistent with the Magnuson Act and other applicable law.

1.2.1 Environmental Assessment

One part of the package is the environmental assessment (EA) that is required by NOAA in compliance with the National Environmental Policy Act of 1969 (NEPA). The purpose of the EA is to analyze the impacts of major federal actions on the quality of the human environment. The EA serves as a means of determining if significant environmental impacts could result from a proposed action. If the action is determined not to be significant, the EA and resulting finding of no significant impact (FONSI) would be the final environmental documents required by NEPA.

An EIS must be prepared if the proposed action may be reasonably expected to: (1) jeopardize the productive capability of the target resource species or any related stocks that may be affected by the action; (2) allow substantial damage to the ocean and coastal habitats; (3) have a substantial adverse impact on public health or safety; (4) affect adversely an endangered or threatened species or a marine mammal population; or (5) result in cumulative effects that could have a substantial adverse effect on the target resource species or any related stocks that may be affected by the action.

This EA is prepared to analyze the possible impacts of management measures and their alternatives that are contained in Amendment 17/22 as well as the proposed regulatory amendment to define groundfish pots.

Certain management measures are expected to have some impact on the environment. Such measures are those directed at harvests of stocks and may occur either directly from the actual harvests (e.g. removals of fish from the ecosystem) or indirectly as a result of harvest operations (e.g.

effects of bottom trawling on the benthos--animals and plants living on, or in, the bottom substrate). Environmental impacts of management measures may be beneficial when they accomplish their intended effects (e.g. prevention of overharvesting stocks as a result of quota management). Conversely, of course, such impacts may be harmful when management measures do not accomplish their intended effects (e.g. overharvesting may occur if quotas are incorrectly specified). Environmental impacts that may occur as a result of fishery management practices are categorized as changes in predator-prey relations among species in the ecosystem, physical changes as a direct result of fishing practices, and nutrient changes due to processing and dumping of fish wastes.

1.2.2 Regulatory Impact Review

Another part of the package is the Regulatory Impact Review (RIR) that is required by National Marine Fisheries Service (NMFS) for all regulatory actions or for significant Department of Commerce or NOAA policy changes that are of significant public interest. The RIR: (1) provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; (2) provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problems; and (3) ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether any proposed regulations are major under criteria provided in Executive Order 12291 and whether or not proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act (P.L. 96-354, RFA). The primary purpose of the RFA is to relieve small businesses, small organizations, and small governmental jurisdictions (collectively, "small entities") of burdensome regulatory and recordkeeping requirements. This Act requires that if regulatory and recordkeeping requirements are not burdensome, then the head of an agency must certify that the requirement, if promulgated, will not have a significant effect on a substantial number of small entities.

This RIR analyzes the potential impacts of alternatives considered for Amendment 17/22. It also provides a description of and an estimate of the number of vessels (small entities) to which regulations implementing these amendments would apply.

1.3 Catch and Value of Groundfish in the Alaska EEZ.

In the BSAI, domestic harvests increased from 1.24 million mt in 1989 to over 1.7 million mt in 1990, an increase of 37 percent. Domestic (domestic annual processing=DAP) catches of pollock increased by 37 percent, from nearly 1,016,000 mt to nearly 1,390,000 mt. DAP catches of Pacific cod, Pacific ocean perch, Atka mackerel, arrowtooth flounder and yellowfin sole also increased markedly.

1.4 Description of the 1991 Domestic Fishing Fleet Operating in the Alaska EEZ.

The NMFS vessel permit database has been examined to determine the current composition of the domestic groundfish fishing fleet. A total of 2,070 vessels were Federally permitted to fish for groundfish in the Bering Sea and Gulf of Alaska in 1990 This value is based on the number of 1990.

Through March 19, 1991, 1,737 vessels have been permitted (Table 1.1). This number will increase, especially as a result of newly permitted hook-and-line vessels prior to the start of the May 15, 1991 sablefish fishery.

Fishing operations in which these vessels participate include: harvesting only, harvesting and processing, processing only, and support. The latter type of operation includes transporting fishermen, fuel, groceries, and other supplies to other vessels.

Of the total 1,737 vessels, 96%, or 1,673, are five net tons or larger. Four percent, or 64 vessels, are less than five net tons.

Vessels Five Net Tons or Larger

The larger vessels, i.e., those that are 5 net tons or larger, are based in Seattle, Sitka, Kodiak, and Dutch Harbor, and other ports. Most of these larger vessels come from Alaska, based on telephone area codes given with permit applications. The numbers of vessels that come from Alaska is 1,017, the number from the Seattle area is 465, and the number from other areas is 191 (Table 1.2). The total number of catcher vessels (harvesting only) and catcher/processor vessels (harvesting/ processing) is 1,431 and 156, respectively (Tables 1.3 and 1.4).

Vessels involved in harvesting only (CATCHER VESSELS) employ mostly three types of gear: hook-and-line, trawls, or pots. Most of the catcher vessels are hook-and-line vessels and number 796 (Table 1.3). They are the smallest vessels fishing groundfish, having average lengths of 47 feet and average net tonnages of 26 NT. Pot vessels number 65. They have average lengths of 85 feet and average net tonnages of 108 NT. Trawl vessels number 124. They have average lengths of 103 feet and average net tonnages of 148 NT.

Vessels involved in harvesting and processing (CATCHER/PROCESSOR VESSELS) also employ mostly hook-and-line, trawls, or pots. The number of catcher/processor vessels using hook-and-line gear is 40 (Table 1.4). These vessels are the smallest of the catcher/processor vessels but are larger than the catcher vessels using hook-and-line gear. They have average lengths of 107 feet and average net tonnages of 198 NT. Pot vessels number 10. They have average lengths of 149 feet and average net tonnages of 323 NT. Trawl vessels number 68. They have average lengths of 102 feet and average net tonnages of 170. NT.

Some vessels are involved in processing only (motherships). These vessels average 3,306 net tons and lengths of 271 feet.

The number of vessels by length, by gear type, and by operating mode varies. Table 1.5 summarizes these parameters.

Table 1.1 Numbers of groundfish vessels that are less than 5 net tons or 5 net tons and larger that are Federally permitted in 1991 to fish off Alaska. NMFS data through 03/19/91.

Mode	Number of Occurrences		
	< 5 nt	>= 5 nt	Total
CATCHER	62	1431	1493
CATCHER/PROCESSOR	0	156	156
PROCESSOR	0	25	25
SUPPORT ONLY	0	35	35
OTHER	2	26	28
TOTAL	64	1673=	1737

Table 1.2 Numbers of groundfish vessels that are Federally permitted to fish off Alaska in 1991 from the Seattle area, Alaska and from other areas. All vessels 5 net tons or larger.

Mode	Number			
	Seattle Area	Alaska	Other Areas	Total
CATCHER	296	970	165	1431
CATCHER/PROCESSOR	105	30	21	156
PROCESSOR	22	3	0	25
SUPPORT ONLY	30	4	1	35
OTHER	12	10	4	26
TOTAL	465	1017	191	1673

Table 1.3 Numbers and statistics of CATCHER VESSELS by gear type that are Federally permitted to fish off Alaska in 1991. All vessels 5 net tons or larger.

Mode	Avg. Number	Avg. Net Tons	Length (ft)
HOOK-AND-LINE	796	26	47
POTS	65	108	85
TRAWL	124	148	103
OTHER GEAR 1/	446	54	60
TOTAL	1431		

1/ Other gear includes combinations of hook-and-line, pots trawls, jigs, troll gear, and gillnets.

Table 1.4 Numbers and statistics of CATCHER/PROCESSOR and PROCESSOR VESSELS by gear type that are Federally permitted to fish off Alaska in 1991. All vessels 5 net tons or larger.

	Avg Number	Avg NT	Avg length (ft)
CATCHER/PROCESSOR			
HOOK-AND-LINE	40	198	107
POTS	10	323	149
TRAWL	68	972	213
OTHER GEAR 1/	38	170	102
TOTAL	156		
PROCESSOR	25	3306	271

1/ Other gear includes combinations of hook-and-line, pots, trawls, jigs, troll gear, and gillnets.

Table 1.5 Numbers of vessels Federally permitted to fish off Alaska in 1991 by 25-foot length increments, by gear type and by operating mode. Support vessels are excluded. Other = multiple gear. NMFS data through March 19, 1991

	Catcher				Catcher/Processor				Processor
Length (ft)	Trawl	Pot	LL	Other	Trawl	Pot	LL	Other	
<= 24	0	0	18	5	0	0	0	0	0
25 - 49	4	8	543	207	0	0	8	10	0
50 - 74	13	23	249	140	0	1	3	4	0
75 - 99	50	11	24	77	3	0	8	5	0
100-124	34	16	5	26	2	1	3	3	0
125-149	11	2	1	5	7	2	8	6	1
150-174	8	5	0	3	8	3	7	5	6
>= 175	5	0	0	0	48	3	3	5	18
SUBTOTALS	125	65	840	463	68	10	40	38	25

TOTAL CATCHER & PROCESSOR VESSELS	1674
TOTAL SUPPORT VESSELS	35
TOTAL OTHER MODES	28
TOTAL VESSELS	1737

2.0 EXPERIMENTAL FISHING PERMITS

2.1 Need for Action

Most information used in conservation and management of the Alaska groundfish fisheries results from fishery research. Such research is usually conducted by the NMFS Alaska Fishery Science Center, although it may also be conducted by the Alaska Department of Fish and Game, the University of Alaska, etc. Fishery research is not governed by Magnuson Act authority, i.e., it is not controlled by Federal regulations implementing the FMPs.

Some information also could be obtained from properly controlled fishery experiments if authorized by the FMPs. No technical differences exist between what could be considered to be research and experiments. Types of experiments that might be conducted under the authority experimental fishing permits include:

Fishing in areas where the total allowable catch (TAC) has been reached, e.g. determine abundance of minor target species components of a complex;

Fishing with gear types otherwise prohibited; and

Fishing in areas otherwise closed to all fishing.

When TAC remains, any mortality resulting from experimental fishing will be counted against TAC. If TAC does not remain, then any mortality will be compared only to overfishing definition. Gaps in fishery information exist that might be filled by either research or fishery experiments. For example, gear designs to reduce incidental catches of prohibited species while maximizing groundfish catches could be improved by either research or fishery experiments.

Neither groundfish FMP currently authorize fishery experiments, or specific harvests of groundfish to support experiments. This amendment proposes to establish that authorization.

2.2 The Alternatives

2.2.1 Alternative 1: Do nothing

Under this alternative, any requests to conduct fishery experiments must be rejected, because the FMPs do not authorize such experiments. Opportunities to collect information that might be useful for fishery conservation and management would be lost.

2.2.2 Alternative 2: Implement a process for allowing experimental fishing.

Three options are considered under this alternative. Each option pertains to the level of review required by either the Regional Director and/or the Council. Application requirements and approval procedures are the same under each option.

Under Option 1, only the Regional Director, in consultation with the Alaska Fishery Science Center, would review and take action to approve or deny an experimental fishing permit. The Council would be notified of any decision by the Regional Director, but otherwise would not be involved. Under Option 2, the Council would always be consulted by the Regional Director. No exceptions would be made. Under Option 3, provision for expedited review by the Regional Director would be made.

Option 3 would allow the Regional Director, in consultation with the Alaska Fishery Science Center, to publish a notice of application receipt in the Federal Register with a brief description of the proposal and a cut)off date for receipt of additional applications to participate in the same or a similar experiment, or statement of reasons why participation is limited to the applicant.

Under either option for Alternative 2, both FMPs would be amended to authorize experimental fishing that would otherwise be prohibited. Implementing regulations might be implemented with the following provisions:

> No experimental fishing may be conducted unless authorized by an experimental fishing permit issued by the Regional Director to the participating vessel.

Application Requirements

An applicant for an experimental fishing permit shall submit to the Regional Director a written application including:

> 1. A statement of the purpose and goal of the experiment, including justification explaining why issuance of experimental fishing permit is warranted;
>
> 2. Technical details about the experiment, including the area and timing of the experiment, vessel and gear to be used, experimental design, scientific staffing for the experiment, sampling procedures, the data and samples to be collected, analysis of the data and samples, provision for public release of all obtained information, and submission of interim and final reports;
>
> 3. A description of the species to be harvested, amount of such harvest necessary to conduct the experiment, and arrangement for disposition of all species taken;
>
> 4. The willingness of the applicant to carry observers, if required by the Regional Director, and a description of accommodations and work space for the observer(s); and
>
> 5. Details for all coordinating parties engaged in the experiment and signatures of all representatives of all principal parties.

Review Procedures

The Regional Director, in consultation with the Alaska Fishery Science Center, will review each application and will make a preliminary determination whether the application contains all the information necessary to determine if the proposal constitutes a valid experimental program

appropriate for further consideration. If the Regional Director finds any application does not warrant further consideration, both the applicant and the Council will be notified in writing of the reasons for the decision. If the Regional Director, after consulting with the Alaska Fishery Science Center, determines any application warrants further consideration, a notice of receipt of the application will be published in the Federal Register with a brief description of the proposal. The notice may establish a cut)off date for receipt of additional applications to participate in the same or a similar experiment. The Regional Director also will forward copies of the application to the Council.
If the Regional Director finds the application is complete and warrants further consideration, he will consult with the Council concerning the permit application. The Council shall notify the applicant in advance of the meeting, if any, at which the application will be considered, and invite the applicant to appear in support of the application if the applicant desires.

Notifying the Applicant

The Regional Director shall notify the applicant in writing of the decision to grant or deny the experimental fishing permit as soon as practicable after the expedited review or after consulting with the Council, and, if denied, the reasons for the denial.

Grounds for Denial

Grounds for denial of an experimental fishing permit include, but are not limited to, the following:

1. The applicant has failed to disclose material information required, or has made false statements as to any material fact, in connection with the application; or

2. According to the best scientific information available, the harvest to be conducted under the permit would detrimentally affect any species of fish in a significant way; or

3. Issuance of the experimental fishing permit would inequitably allocate fishing privileges among domestic fishermen or would have economic allocation as its sole purpose; or

4. Activities to be conducted under the experimental fishing permit would be inconsistent with the intent of this section or the management objectives of the FMP; or

5. The applicant has failed to demonstrate a valid justification for the permit; or

6. The activity proposed under the experimental fishing permit could create a significant enforcement problem.

7. The applicant failed to make available to the public information that had been obtained under a previously issued experimental fishing permit.

In the event a permit is denied on the basis of incomplete information or design flaws, the applicant will be provided an opportunity to resubmit the application. If, however, a permit is denied because experimental fishing would detrimentally affect fish stocks, have economic allocation as its sole

purpose, be inconsistent with the management objectives of the FMP, or create significant enforcement problems, the decision of the Regional Director will be the final action of the agency.

If the permit is granted, the Regional Director will publish a notice in the Federal Register describing the experimental fishing to be conducted under the experimental fishing permit.

The Regional Director may attach terms and conditions to the experimental fishing permit consistent with the purpose of the experiment. Unless otherwise specified in the experimental fishing permit or a superseding notice or regulation, an experimental fishing permit is effective for no longer than one year unless revoked, suspended, or modified. Experimental fishing permits may be renewed following the above application procedures.

Predicting what types of information collections might be authorized by experimental fishery permits is not practical. Each type will be considered on a case-by-case basis when reviewing the application for an experimental fishing permit.

2.3. Environmental impacts of the alternatives

2.3.1 Biological and Environmental Impacts

2.3.1.1 Alternative 1.

Experimental fishing would not be authorized under this alternative. No changes in biological and environmental impacts would occur.

2.3.1.1 Alternative 2.

Experimental fishing might be allowed under this alternative. Biological and environmental impacts would depend on the type of experimental fishing that might be conducted. Information obtained might serve to reduce adverse impacts on the environmental. For example, gear designs might be improved to catch more groundfish of a desirable size or species composition which would reduce amounts of groundfish that are discarded at sea as waste. Thus, fishing activities might become more efficient, reducing fishing activity otherwise required and reducing adverse impacts on the sea bed and associated animals and plant life.

2.3.2 Socioeconomic Impacts

2.3.2.1 Alternative 1.

Industry costs

No program for authorizing experimental fishing opportunities would be implemented under this alternative. Benefits that the fishing industry might have accrued from information obtained from experimental fishing would be foregone.

Management and Consumer Costs

No changes in management and consumer costs would occur as a result of this alternative.

2.3.2.2 Alternative 2.

Industry costs

Industry costs under this alternative are those associated with completing an application as well as actually accomplishing the fishery experiment. Information so obtained, however, might result in increased efficiency in fishing operations. In the long run, industry costs would be reduced.

Management and Consumer Costs

Management costs would be those processing the application for a fishery permit as will as those that might result from overseeing or participating in the fishery experiment. Consumer costs could be reduced if reduced industry costs are passed on to the consumer.

3.0 ESTABLISH WALRUS ISLANDS GROUNDFISH FISHING CLOSURE

This management measure is before the Council not as a result of significant new biological or economic information, but rather due to the fact that the time/area closures are scheduled to expire at the end of 1991. Therefore, this section updates the analysis contained in the 1989 EA/RIR for Bering Sea Amendment 13.

3.1 Need for the Action

In 1987 and 1988 the number of walruses hauled out on Round Island (Walrus Islands State Game Sanctuary) and at Cape Peirce (Togiak National Wildlife Refuge) declined by more than 50%, coincident with the initiation of fishing for yellowfin sole in northern Bristol Bay. Personnel on Round Island reported frequent, loud noise on the island for the first time in 1987; the sounds heard were emanating from a fleet of vessels fishing for yellowfin sole. The frequency of other human related activities which are potentially disruptive to walruses (e.g., from other fisheries such as salmon, herring, etc.) have been relatively constant in northern Bristol Bay over the past few years. Conclusive data establishing a direct cause and effect between the sounds generated by the yellowfin sole fishery and the decline in walrus numbers are not available. However, in 1989 Federal and State agencies, Native groups, and conservation organizations were concerned that these sounds were likely disturbing walruses to the point of adversely affecting their use of beaches in the region for hauling out.

In 1989 the North Pacific Fishery Management Council (Council) reviewed the biological and hydroacoustic information available at the time. It recommended to the Secretary of Commerce that a 12 mile buffer zone be instituted around Round Island, The Twins Island group, and Cape Peirce. This buffer zone with a seasonal restriction on groundfish fishing was to stay in effect for two years at which time the Council wanted to review the status of the walrus populations and the effects of the closed areas. The buffer zone was approved by the Secretary (Amendments18/13, NPFMC, 1989), became effective in 1990, and is due to expire at the end of 1991.

It is not clear which type of sound would disturb walruses the most, air or water borne. Waterborne sounds might discourage submerged walruses from even attempting to enter regions where traditional haulout beaches are located, while airborne sounds may chase animals off haulout beaches. Therefore, the types of sound to be controlled should be tailored to the type of protection desired. It has been suggested that the most probable noise disturbance of walrus haulouts in northern Bristol Bay is underwater vessel noises which may cause walruses to avoid returning to nearby haulout sites and go elsewhere instead (Hessing 1991; Hills 1991; Seagars 1991, personal communications). Since 1988 no fishing has occurred in the 12-mile buffer surrounding Round Island and the number of walruses seen on haulout beaches there has increased dramatically. However, numbers of walruses seen at haulout sites around Cape Pierce has decreased dramatically since 1988. To the extent that there may be interchange of walruses between the two haulout sites, it is difficult to draw any conclusions from these trends.

There are four zones of underwater noise influence to be considered when assessing the potential effects of man-made noise on walrus (Richardson and Malme 1991). The zone of audibility refers to an area where walrus might hear a noise. The zone of masking describes that area where a noise

level is high enough to interfere with other sounds such as communication and ambient noise. The zone of responsiveness is an area of greater intensity where a walrus would react to the noise. The zone of discomfort is the most extreme, a walrus could be damaged by the noise. The purpose of the measures in this document are to determine if a zone of responsiveness or masking exists and, if so, what measures can be taken to reduce them to a zone of audibility. No evidence suggests that a zone of discomfort is playing a part in walrus/fishery interactions in northern Bristol Bay at this time.

The following alternatives include proposals allowing (1) all the protective measures to expire, (2) making the twelve mile buffer zones permanent, and (3) closing an area shoreward from Cape Constantine to Cape Peirce. Options to each of the latter two alternatives which would extend the restrictions for five years are also included.

Background

3.1.1 Walrus

The Pacific walrus population is found almost entirely in the Bering and Chukchi seas. Walruses are marine mammals who can live, eat and sleep at sea. However, they spend a great deal of time resting on ice and, for breeding-age males, on coastal haulouts. During the early spring breeding period, two concentration areas exist in the Bering Sea, one of which is near Kuskokwim Bay. During summer adult females and juveniles are associated with the pack ice which moves north through Bering Strait, while most adult males move to coastal haulouts in Alaska and Chukotka (USSR). The males that use Bristol Bay haulouts may be those from the Kuskokwim breeding area. Studies to determine population distributions by use of DNA separation are now underway by the U.S. Fish & Wildlife Service (USFWS) and LGL Ecological Genetics.

When males first reach their coastal haulouts in Bristol Bay in mid-April to early May, many seem to be thin and exhausted and many also exhibit a high incidence of fresh wounds, possibly related to breeding activity (Hills 1991, personal communication). Throughout the summer cycle of feeding and resting they gain weight and heal. The typical summer activity cycle for bulls is a rest period at a haulout for 2-3 days and then at-sea activity for 10-14 days. Males often haul out in groups in what seems to be a loosely coordinated movement. Empty beaches can fill to over 1,000 animals hauled out in 12 hours (Hessing 1991, personal communication). They are very gregarious on haulouts. It has been noted that more walruses seem to haul out during flat calm days with grey skies (Hessing 1991, personal communication).

Walruses typically feed on bivalve mollusks in shallow continental shelf waters (Fay 1985). It is not known for certain where the walruses summering in Bristol Bay feed. Radio tracking of walruses during their time at-sea has shown that many are south of Round Island just below 58°N. It is suspected that this is an area where the bulls sleep and not necessarily where they feed (Hills 1991, personal communication). Movement to this area seems to be south from the Walrus Islands. Walruses returning to the islands seem to do so from the south although the direction can vary from as far east as the direction of Cape Constantine to a southwestly direction. Those returning to Cape Peirce seem to do so from the direction of Hagemeister Island (Hills 1991, personal communication).

All walruses molt (e.g. shed old hair) in the summer between May and September. In order to molt walruses must raise their skin temperature, and to do this they must leave the water. Those walruses associated with ice in the summer use it as a warming platform while most bulls use coastal haulouts. The molting process is gradual taking from six to eight weeks for mature bulls and a longer time for younger ones.

Walruses are legally taken by Alaskan Native subsistence hunters, the only people allowed to take walrus without permits as provided for in the Marine Mammal Protection Act (16 USC 1361 *et seq.*). There is also some illegal poaching. Virtually all hunting occurs to the north of Bristol Bay in the waters of the Gulf of Anadyr, the northern Bering Sea and Bering Straits, and along northern coastal Alaska (Seagars et al. 1989). Most hunting by Alaskan Natives occurs farther north than Bristol Bay (Taylor 1989).

The Soviet Union, the only other country in which the Pacific walrus is found, established 12-mile closures around all its coastal walrus haulouts in 1960 and terminated all ship-based walrus harvesting in 1990 (Popov 1991, personal communication). The benefits of the Soviet measures are unknown as walrus numbers increased across all areas from 1960 to 1985. Terrestrial walrus haulouts are a clearly identifiable habitat of considerable biological significance. The need to study and protect such areas was emphasized recently at an international workshop on walrus ecology and management (Fay et al. 1990). It is reported that repeated disturbances on land can lead to permanent abandonment of haulout sites (Gol'tsev 1968).

Use of coastal haulouts increased greatly in recent decades as the population recovered from depletion caused by overexploitation in the first half of this century. The first areas to be re-occupied in northern Bristol Bay were Round Island and Big Twin Island, where groups of walruses were seen hauled out in 1953 (Figure 1). Round Island rapidly developed into a major haulout site, being used by several thousand animals throughout the summer. In 1981 walruses began hauling out regularly and in large numbers at Cape Peirce. In the southeast Bering Sea, Round Island, North Twin Island, and Cape Peirce are the primary summer haulout areas while Port Moller and Cape Seniavin are also important in the spring and fall (Frost et al. 1983; LGL 1989). Figure 2 shows walrus haulout locations for Round, Twin, and High Islands, Capes Peirce and Newenham, and Security Cove. Other locations in Bristol Bay that have been used include Amak Island and Port Moller.

The peak number of walruses counted on Round Island has fluctuated over time. Numbers declined from about 15,000 in 1978 to about 6,000 in 1984 (Table 1). The decline was attributed to disturbance resulting from the developing Togiak herring fishery and from arriving and departing visitors. State regulations were made more restrictive in 1984 by increasing the controlled access area around Round Island from 0.5 to 2.0 miles; the numbers of walrus hauled out subsequently increased to a peak of 12,500 in 1986. The size of the controlled access zone was further increased to 3.0 miles in 1989. This is the maximum zone within which the State is allowed to limit access. The Federal Aviation Administration, at the request of the State, issued a notice of airspace restriction prohibiting overflights of less than 2,000 feet within one-half mile of Round Island. One reason for the aircraft restriction was to reduce disturbance associated with the herring fishery.

In 1987 daily counts and peak haulout counts on Round Island declined dramatically, and peak numbers never exceeded 5,300. Counts were even lower in 1988 with a maximum of 4,424. The only

obvious change in human activity in the area was a large fleet of vessels associated with the yellowfin sole fishery that appeared in the vicinity of Round Island for the first time in 1987, and returned in 1988. In 1989 the yellowfin sole fleet did not fish in the vicinity of Round Island and the peak count of walruses rebounded to 7,792. The peak count for 1990, when fishing was prohibited by National Marine Fisheries Service (NMFS) regulation, was 6,891 (Table 1).

At Cape Peirce (about 60 miles west of Round Island) the peak number of walruses hauling out increased to 12,548 in 1985. The peak count declined to 6,249 in 1987, increased to 6,938 in 1988 (when walrus numbers were low on Round Island), and then dropped considerably to 2,436 in 1989 and 1,474 in 1990 (when walrus numbers increased at Round Island). Some disturbance occurs at Cape Peirce haulouts due to subsistence hunting, aircraft, and boats. The frequency of disturbance is thought to have been relatively constant from year to year. Vessels associated with the yellowfin sole fishery have not been observed in the area.

The USFWS has been conducting studies of walrus distribution, abundance, and movements in Bristol Bay. Tagging of animals with satellite-linked transmitters has confirmed that Round Island and Cape Peirce, as well as Cape Seniavin on the Alaska Peninsula, are used by a single group of walruses that feeds and rests in the Bristol Bay area in the late spring and summer. It has been observed that the walruses using Round Island as a primary haulout have more site fidelity than those using Capes Peirce or Seniavin (Hills 1991, personal communication). A minimum total number of animals using the bay each year has been derived by correlating and summing daily counts from Cape Peirce and Round Island. The results suggest that the total number of walruses was relatively constant during 1987-1989 (8,551-8,952 animals counted), and dropped in 1990 (to 7,192). The recent changes in distribution can therefore be most readily explained as a shift in haulout use from Round Island to Cape Peirce in 1987 and 1988, followed by an increase in use of Round Island in 1989 and 1990.

Walrus numbers at Cape Pierce and Walrus Islands still, however, remain substantially below numbers recorded prior to 1987 (Table 1). If the decline between 1986 and 1987 was disturbance related, then perhaps a longer time period or a larger buffer zone may be required for the area's population to return to former levels. The lack of recovery may also be due, in part, to a general decline in the Bering Sea walrus population. Initial analysis of the 1990 Bering Sea walrus survey indicates that some decline may have occurred since 1985. Anecdotal reports from Soviet scientists and Eskimo hunters also indicate a decline may have occurred, particularly in adult male numbers (F. Fay, pers. comm.). Such a decline, if it has occurred, would provide an additional reason for protection of the north Bristol Bay walrus haul-out sites.

Ideally, any trend in numbers of walruses (adult males) seen at haulout sites should be viewed in the context of overall walrus population trends to be meaningful. A joint U.S./Soviet survey is conducted every five years to evaluate walrus numbers throughout their range. The results of the 1985 survey represent the latest confirmed figures. Since this survey occurred before the 1988 12-mile closures, the results are meaningless in the absence of confirmed numbers from the 1990 survey. Data from the 1990 survey is unconfirmed at this time, but it is expected that the estimates will be considerably lower than the 1985 survey, but still within the Optimum Sustainable Population range (Nichols, 1991, personal communication). Until the 1990 survey data is finalized, it is impossible to make any comparisons between haulout numbers and overall population numbers.

3.1.2 Walrus Islands Sanctuary

While a number of different haulouts in the Bristol Bay area are used by walruses not all haulouts have the same attributes. Amak Island was used by several hundred walruses in the 1960's but may be less suitable now due to rockslides. Walruses have used several haulouts in the Port Moller area, especially Deer Island. However, those haulouts are not currently used perhaps due to the large amount of vessel traffic in the area. Cape Seniavin is used by 1-2,000 walruses usually in April and May and again in the fall. This is a dangerous location for walruses to use in the summer when heat causes sloughing of the bluff and falling rocks have lead to walrus deaths. Cape Peirce has a limited amount of beach space for walruses. Also, a tidal flat has built up in recent years which walruses must cross to get to the beach. Cape Newenham has only a pocket beach and is not suitable for large numbers of animals. Security Cove has had some use but it is shallow, has extensive eelgrass beds, and generally does not resemble other walrus haulouts (Hills 1991, personal communication). Only the Walrus Islands group, especially Round Island, offer sufficient suitable haulout locations. In addition, Round Island and the other islands offer a number of beaches facing different directions so that walruses can haul out during stormy weather. It is not known how distance from the feeding grounds may affect walrus choices on haulouts. The Walrus Islands are the closest group to the area where walruses rest at sea. Whether such relative proximity is coincidental or necessary is unknown.

In 1960 the State of Alaska created the Walrus Islands State Game Sanctuary to protect habitat important to walruses and other wildlife. It includes a group of seven islands and the surrounding state waters. Round Island is the most regularly used walrus haulout site and has developed into a major site for scientific study, and commercial and public wildlife uses. Other marine mammals hauling out on islands in the Sanctuary include northern sea lions and harbor seals (LGL 1989). Access to Round Island is allowed only from May 1 through September 1, and requires a permit from the Alaska Department of Fish and Game (ADF&G). Two State field biologists are present on the islands during most of this period to supervise visitors and monitor marine mammals. In order to prevent disturbance to walruses, Sanctuary regulations limit total daily visitation, visitor activities, and access methods.

Annual Number of Visitor-Days at Round Island

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
136	277	198	468	N/A	175	379	752	599	668	588

The Sanctuary provides a unique opportunity for viewing large numbers of walruses in a remote setting with minimal human interference. It is the only preserve of its type in the world and the most easily accessible site to see large numbers of walruses. Each year visitors from all over the world come to the Sanctuary to view the marine mammals, birds, and scenery. Many return home to write travel articles, stories and publish pictures of the walruses and islands. Each year these appear in magazines, calendars, and papers all over the world and have been enjoyed by tens of millions of people. As an example, a feature article in Backpacker Magazine (Lay 1989) emphasized the quietness of Round Island and the wilderness aspects. The article increased public awareness of the Sanctuary and was commented on by several visitors in 1990 (Hessing 1991, personal communication). In 1990 three commercial media crews visited Round Island, two from television and one audio crew, and three commercial tour groups booked visitors there. About 15% of all camping visitors in 1990 were professional photographers (ADF&G 1991).

As with many resources, most of the social value of walruses may be composed of non-consumptive use value and existence or option value. An example of non-consumptive use value is the value people obtain from watching walruses in their natural habitat. An example of existence value is simply knowing that such a place exists. The fact that legislation, such as the Marine Mammal Protection Act, forbids or severely restricts most commercial uses of marine mammals indicates that our society values the existence and non-consumptive uses more than the commercial value of the animals. The Act also shows that our society places a very high value on marine mammals in particular, enough to the extent that any non-permitted activity which even disturbs marine mammals is considered taking of the animals and treated as if the animals were killed.

3.1.3 Yellowfin sole

Yellowfin sole are the second most abundant commercial groundfish species in the eastern Bering Sea. Harvests increased from 59,000 mt in 1977 to 227,000 mt in 1985 (Table 2). Since that time they have decreased to 86,000 in 1990 due to phasing out first the foreign and then the joint venture fishing operations. The stocks are healthy and at high abundance levels (NPFMC 1990).

Prior to 1987 most yellowfin sole fishing occurred outside of northern Bristol Bay. In 1987 a NMFS regulation established a seasonal closure of the groundfish fishery south of 58° once quotes set for bycatch of crab and halibut were reached. In 1987, and again in 1988, vessels began fishing in northern Bristol Bay shortly after the bycatch closure was implemented (Table 3). As shown in Figures 3 and 4, fishing in northern Bristol Bay usually began in April and continued until the yellowfin sole quota was reached (June - July). On March 1, 1989 NMFS closed the Bering Sea joint venture fishery and reopened it in early September. Fishing effort in the later part of the year was to the north of where it had been in the early spring (Figures 5 and 6). In 1990 the joint venture fishery was closed in the beginning of March due to bycatch limits and reopened for just one week in June. Observer data, especially on the domestic fleet, is not yet available for 1990 (Narita 1991, personal communication). Beginning in 1991 the directed fishery for yellowfin sole, included in the "other flatfish category", will not begin until May 1. The predominant fishing activity in northern Bristol Bay has been joint ventures (domestic harvesting vessels delivering to foreign processing vessels). Beginning in 1991 there are no joint venture allocations and all harvesting and processing is by U. S. vessels and shoreplants.

The preferred fishing area in northern Bristol Bay is to the west of the Nushagak Peninsula north of Cape Constantine (Figure 1). Fishing occurs in very shallow waters, from the beach to some distance offshore. Some of the past fishing activity was centered in the Togiak herring grounds very close to shore (Funk 1991). Yellowfin sole concentrate there and trawlers fill the shallow water column with nets. There was very little observed herring bycatch during this fishery even though herring were present in large numbers (Funk 1991, personal communication).

Observer sampling has indicated that trawl catches from Northern Bristol Bay are composed of 95-99% yellowfin sole. The prohibited species bycatch (PSC) of salmon, halibut, Tanner crab, and king crab from this area and the Bering Sea are presented in Table 4. Within northern Bristol Bay during the period 1987-88, the number of PSC individuals caught per metric ton was usually greater when closer to the Sanctuary while the average weight of the individuals was usually less. The PSC catch

rate in the remainder of the Bering Sea was always higher, often by an order of magnitude, while the average weight per individual was sometimes less.

During 1987 and 1988, the vessels targeting on yellowfin sole in northern Bristol Bay were domestic harvesting vessels (typically less than 125') and large foreign processors. In 1987 about 75 vessels (catcher boats 85-120 feet long and processors 300-600 feet long) operated in the area. In 1988 more vessels were there with as many as 180 visible from Round Island at one time (Hessing 1991, personal communication). No trawl or processing vessels have been observed near Cape Peirce by onshore observers. However, in 1987 a great amount of fishing effort occurred in the lower Kuskokwim Bay west of Cape Peirce (Figure 3). In 1988 there was no significant effort focused in Kuskokwim Bay but instead concentrated off the Nushagak Peninsula (Figure 4). In 1989 the domestic yellowfin sole fleet did not carry observers but is not believed to have operated in the vicinity of Round Island. In 1990 during the short joint venture fishery in the area some effort occurred just outside the 12 mile buffer zone. During this fishery two processing vessels collided and one sunk approximately 14 miles from Round Island (Sheffield 1990). No reports are available for domestic activity in 1990 nor are data available for the joint venture fishery (Narita 1991, personal communication). Should the domestic fleet targeting on yellowfin sole increase in size it will probably include a number of factory trawlers ranging from 150' to 350' or more. Since these large vessels will be both processing and fishing, and their propeller will be under a heavier load, their noise emissions will be greater than the foreign processors (Thiele et al. 1990).

Although there is a three mile State buffer around Round Island which requires a permit to enter, it is not always honored. During the 1990 yellowfin sole fishery two vessels, one a trawler and one a tender, on separate occasions came within one-half mile of the Island. During the salvage operation on the sunken processor two other vessels approached the island and one came up almost to the primary haulout beach. These three disturbances were all related to the yellowfin sole fishery and they comprise about 15% of the vessel disturbances that year. One resulted in enough disturbance that 50 walruses moved into the water and did not return for at least several hours (ADF&G 1991).

3.1.4 Acoustic environment

Fishing trawlers and other vessels project sound both in air and underwater. Studies of sound examine two components: the level (frequency, measured in Hz) and the intensity (measured in dB). In order to make valid comparisons between sources, measurements are taken in a standardized manner. Thus, the measurements reported here were taken at 1 m from the source and with equipment of a standardized sensitivity.

Most underwater sounds associated with fishing vessels are generated from propeller cavitation and occur at relatively low frequencies (40 Hz-4 kHz). Measurements of a medium-sized trawler showed sound source levels of 169 dB when transiting (at 10 knots) and 157 dB when trawling (at 5 knots) (Urick 1983). Generally speaking, small to medium sized ships operating at full power produce sound levels of 165-175 dB (Malme et al. 1989). These values are comparable to the sound intensity of a Boeing 737 jet at takeoff (185 dB) and at cruise (161 dB). Figure 7 portrays the frequency and intensity of sound emissions for several types of vessels. The fleet expected to be associated with harvesting and processing yellowfin sole consists of a variety of medium and large sized vessels (80'

to over 300'). The aggregate noise level that could be produced by a fishing fleet was considered by Malme et al. (1989). The report states, "if 3 to 6 vessels are operating in close proximity, a 10 to 15 dB increase in local noise level over that expected for a single trawler is possible....this would increase the received levels in the immediate vicinity of the concentrated fishing activity to values found near drillships and dredges." The power load placed on a propeller also makes a difference in the intensity of the sound. At a higher propeller load the noise has a higher dB level at all frequencies.

It is important to note that while sounds traveling in air may attenuate (the dB level may weaken) greatly as distance from the source increases, sounds traveling in water do not attenuate as rapidly; in fact, depending on the frequency and several hydrographic factors, sounds propagated underwater may travel about four times faster (and therefore farther) than those traveling though air. Sounds less than 200 Hz attenuate more rapidly than those of higher frequency. In general, lower frequency sounds (such as those generated by propeller cavitation) travel much farther than higher frequency sounds. Airborne sounds associated with fishing activities have not been studied, but they would result from a variety of sources (engines, generators, hydraulic systems, deck activities, etc.) and probably cover a wide frequency range. These same activities cause vibrations in hulls and become another source of underwater noise.

There is no quantitative information on the hearing ability of walruses since audiograms have never been done (Davis et al. 1990) An audiogram of Pacific walrus is currently in progress in the Netherlands (Hills 1991, personal communication). It is well known that walruses use a complex array of vocalizations both in air and underwater. Vocalizations include snorts, chattering caused by teeth clacking, whistles, and bell-like or gonging sounds. It is suspected that the gonging sounds are made by bulls signaling each other (Seagars 1989). The sounds function in communication and provide important social and behavioral signals. It is suspected that bulls warn off other bulls with certain vocalizations and at other times call each other together, perhaps for activities such as hauling out (Seagars 1989). Underwater studies off Round Island indicate that walrus vocalizations raise calm water ambient sounds 11 dB (USFWS 1991). Most calls occur within a frequency range of 50 Hz to 4 kHz. It is reasonable to assume that walrus hearing is sensitive to sounds occurring within the frequency range of their calls. No studies have been conducted to test the response or perception of walruses to industrial/fishing generated sounds.

Other phocids (harbor, ringed and harp seals) are sensitive to underwater sounds in the 1 or 2 to 50 kHz range (Figure 8, Davis et al. 1990). Sensitivity below 760 Hz has not been tested in these other phocids. For those species of pinnipeds that have been studied (e.g., fur seals and harbor seals), 1,000 Hz sounds are detected when they exceed ambient noise by about 25 dB (Malme et al. 1989). Shallow water ambient noise levels are strongly dependent on sea state. A study conducted by USFWS in 1989 found the underwater ambient noise level at Round Island in to be 69-73 dB during calm conditions, increasing to 80-86 dB with moderate winds and waves. Underwater sounds produced by vessels are within the frequency range of submerged sounds produced by walruses. It is therefore virtually certain that walruses perceive noise from the fishing fleet over a large area, even in windy weather. Because these sounds are within the same frequency used by walruses it is possible that loud intense vessel noise could mask the calls of walruses and inhibit signaling between walruses at sea and those near the shore preparing to haulout.

3.1.5 Underwater environment

Sounds produced by the fishery may impact walruses in two ways. Airborne sounds, which can be clearly heard by people on Round Island, may influence the behavior of animals hauled out on the beaches. Fewer walruses may choose to haul out, and those that do may remain ashore for shorter periods of time. Also, walruses may encounter intense and unusual underwater and airborne sounds produced by fishing activity as they approach Round Island from sea. They may choose to avoid this strongly ensonified area and swim to haulouts elsewhere or spend long, perhaps energetically expensive, periods at sea. Brueggeman et al. (1990) conducted a study to examine the impact of oil and gas exploratory activities on walruses in the Chukchi Sea pack ice. They stated that, "During icebreaking activities, animals moved 20-25 km (11-13 nmi) from the operations, where noise levels from the ship were 11-19% above ambient. This relationship suggests that the animals were displaced by icebreaking activity to areas where noise levels approached ambient levels."

Descriptions of human induced disturbances to different species of marine mammals including walrus have been published (LGL 1989 and 1991; Davis et al. 1990). Observations from Round Island indicate that walruses seem to be more sensitive to diesels than outboards. A high speed outboard motor running one-quarter mile off a haulout beach did not seem to bother walruses but a slow moving diesel vessel somewhat further out frightened walruses off the same beach (Hessing 1991, personal communication).

Studies conducted on various marine mammal haulouts in the Bering Sea, with its relatively shallow waters, suggest that bottom type plays an important role in sound attenuation (LGL 1989). A sandy/gravel base beneath silt reduces intensity less than a basalt base. Cape Peirce, one of the sites in the LGL study, has such a sandy/gravel base although nearby rock outcroppings may lead to greater sound attenuation. In general, rocky bottomed areas attenuate sounds emanating from distances greater than six kilometers better than do softer bottoms, although the reverse is true of sounds emanating from within three kilometers (Johnson 1991, personal communication).

Underwater acoustic recordings on Round Island in 1990 had to be stopped at one point due to noise interference from a passing vessel. The vessel was transiting from the direction of Cape Constantine to Togiak at about seven miles distance. Even at this distance the noise was so loud that it rendered recordings of walrus vocalizations unusable (Hills 1991, personal communication).

It has been suggested by several scientists that "sound channels" might exist in the vicinity of Round Island. These would be places where the bottom topography would amplify sounds. Whether this amplification would be of walrus vocalizations (beneficial for communication) or vessel noises (disruptive to walrus behavior) or both is at question. One such possible channel in the vicinity of Round Island is a canyon between the Sanctuary and the Nushagak Peninsula.

A related concern is the possible effect of onbottom trawling on benthic communities and walrus food supply. Pacific walruses consume mostly benthic invertebrates, particularly clams. Large groups of walruses such as occur in Bristol Bay require abundant food resources. The effects of groundfish fisheries on walrus food availability both through physical impacts on animals and substrates and through changes in the structure of biological communities caused by harvesting of certain species are unknown.

3.2. The Alternatives

The issue of protecting walrus haulouts by means of time and/or area closures was first developed by the Council in 1989. At that time buffer zones of three, six, and 12 miles were evaluated for various Pacific walrus haulouts in the Bering Sea area, including Cape Newenham, Cape Peirce, the Walrus Islands Sanctuary, Cape Constantine, Hagemeister Island, and Cape Seniavin on the Alaska Peninsula (NPFMC 1989). Possible effects of the groundfish trawl fishery on other components of the walrus ecosystem were considered also, especially effects of bottom trawling on walrus feeding grounds. The issue of feeding grounds interference is of considerable concern; however, since no quantitative data were available to support analyses of this issue, it was not developed further. Based upon low frequency sound transmission characteristics and haulout patterns only three alternatives to the status quo were developed in 1989. These were: the development of a cooperative program involving all concerned parties, a 12-mile radius buffer zone around specific walrus haulout sites with seasonal closures, and a seasonal closure north of a line from Cape Constantine to the southernmost tangent of a 12-mile radius around Cape Peirce. The Council chose the 12-mile radius buffer zones with the provision that the amendment sunset in two years. During Council discussions it was made clear that the buffer zone and the area closure would be analyzed in 1991.

Thus, three alternatives are developed in the following sections: (1) allowing the protective measures to expire, (2) maintaining the 12-mile buffer zone with seasonal closures at three important walrus haulout locations, and (3) a time/area closed zone in northern Bristol Bay. These closures would only restrict groundfish fishing. As defined by the Magnuson Fishery Conservation and Management Act (16 USC 1854 *et seq.*) fishing means, in addition to catching, taking, or harvesting of fish, any activity which attempts to do so, any other activity which can reasonably be expected to result in the former, and any operations at sea in support of, or in preparation for, any activity as listed above.

Possible cause and effect relationships exist between fishing activity and walrus haulout patterns. Suggested studies of walrus to address this issue include: monitoring haulout patterns and abundance at all of the major Bristol Bay haulout sites; tagging and tracking to determine movements and commonly used habitats; and, studies to characterize the acoustic environment and the effects of sound on walruses (MMC 1991). These types of studies have been conducted in the past by the U.S. Fish and Wildlife Service which has received cooperation from the Alaska Department of Fish and Game.

3.2.1 Alternative 1: No action - protective measures expire.

Under this alternative the buffer zone amendment would sunset on December 31, 1991. A 3-mile buffer zone would still exist in State waters around the Walrus Island Sanctuary but not at Cape Peirce. Fishing for groundfish, particularly yellowfin sole, would continue to be governed by other regulations already in place. The domestic fishery has replaced the joint venture fishery. The domestic fleet is expected to increase with factory trawl vessels dominating. However, the overall number of vessels participating would probably decrease because fewer motherships with associated catcher fleets exist. The fishery will not begin until May 1 so activity will begin in the vicinity of northern Bristol Bay rather than move there from other yellowfin sole grounds and the fishery would not be closed before that time due to bycatch limits.

3.2.2 Alternative 2: Establish 12-mile radius buffer zones with seasonal groundfish fishery closures around three walrus haulout sites.

This alternative would continue to close waters within 12 miles of Round Island, The Twins, and Cape Peirce to groundfish fishing activities (Figure 9). The buffer zones would extend nine miles seaward from the State's three-mile limit, where present. A 12-mile buffer would be consistent with the level of protection provided for walrus haulout sites in the Soviet Union, the only other country that shares the Pacific walrus population. A seasonal groundfish fishing closure would be imposed from April 1 through September 30; this corresponds to the period of peak walrus utilization. Fishing would be permitted from October 1 through March 31 inside these zones, although sea ice conditions may prevent vessels from fishing during much of this time period. This alternative would provide a moderate level of protection to walruses because some fishing activity will likely occur relatively close to haulouts but outside the buffer zones during the April 1 - September 30 period.

An option to this alternative would be to sunset the buffer zones after five years, (on December 31, 1996). An evaluation of the buffer zones addressing fishery effects to walruses would be completed prior to the sunset date. This evaluation would present additional information to attempt to evaluate whether or not action was effective, if it should be extended, or if additional corrective measures need to be taken.

This is the alternative the Council adopted in 1989 except with a five year sunset compared to two years. The Council noted the strong correlation between the decrease in walruses hauled out on Round Island, and the activity of the yellowfin sole fishery during 1987 and 1988. It also noted the lack of evidence establishing a clear relationship between those two factors. The Council took into consideration (1) that the U.S. Fish and Wildlife Service, in cooperation with the Alaska Department of Fish and Game, was conducting preliminary acoustical studies at Round Island and at Cape Peirce during the summer of 1989 in order to provide more information on the methodolgy that might be used to assess levels of acoustical disturbance caused by vessels of various types and (2) that groundfish fishing in northern Bristol Bay was expected to be at much lower levels in 1989 and 1990 due to the decline of joint venture fisheries for yellowfin sole. Consequently, the Council felt this alternative, with a two-year sunset provision, provided additional protection for walruses in this region while also affording it the opportunity to revisit the issue at this time with additional information.

3.2.3 Alternative 3: Seasonal groundfish fishing closure north of a line from Cape Constantine to the southernmost tangent of a 12-mile radius around Cape Peirce.

This alternative would close a larger area north of a line drawn from Cape Constantine to the southernmost tangent of a 12-mile radius centered at Cape Peirce (Figure 10). A seasonal groundfish fishing closure would be imposed from April 1 through September 30; this corresponds to the period of peak walrus utilization. Fishing would be permitted from October 1 through March 31, although sea ice may prevent fishing during much of this period. Fishing also may occur during April through September outside the limits of the closure zone. This alternative would provide a high level of protection to walruses that transit and haul out in northern Bristol Bay by moving the source of potential disturbance to the south of the important resting areas.

An option to this alternative would be to sunset the closure after five years. An evaluation of the closure addressing fishery effects on walruses would be completed prior to the sunset date. This evaluation would present additional information to attempt to evaluate whether or not the action was effective, if it should be extended, or if additional corrective measures need to be taken.

3.3 Impacts of the Alternatives

The likely impacts of the three alternatives are examined in the following section. There are three parts to the analysis--environmental impacts, fishery impacts, and socioeconomic impacts.

Potential adverse effects on walruses from herring and salmon fisheries were considered in the process of developing this proposal. Most of the vessels fishing for these species are small and do not produce the intensity of sound generated by the much larger groundfish trawlers and factory vessels. These smaller vessels are restricted from fishing within three miles of Round Island and little effort is expended in the immediate vicinity of Cape Peirce. Some direct disturbance to walruses was reported in the past at Cape Peirce and at Round Island as a result of approaches by sight-seeing herring or salmon crews during periods when the fisheries were closed (Hessing 1991, Hills 1991, personal communication). Walruses respond to these disturbances by moving off or staying away from preferred hauling areas. Such direct disturbances could be considered an illegal taking under the Marine Mammal Protection Act and can be regulated through the legal process (NPFMC 1989). Additional measures to protect walruses specific to other fisheries may be proposed to other management bodies in the future. A review of the salmon and herring fisheries in northern Bristol Bay is included as Appendix I.

The principal fishery in the proposed groundfish fishing closure area is for yellowfin sole. Little information is presently available to evaluate the impact of the three alternatives on the Bering Sea yellowfin sole stock. The enactment of either of the closure alternatives would reduce the population removals in an area characterized by shallow waters where large, almost pure catches of yellowfin sole are obtained. Reports from observer sampling of the fishery in the Togiak Bay area indicate the dense aggregations of yellowfin sole are in spawning condition. What effect fishing has on this spawning stock is unknown, particularly in light of the widespread distribution of yellowfin sole throughout the Bering Sea shelf and their present high abundance level.

In 1988 the first estimation of the abundance of yellowfin sole (and other groundfish resources) in the area between Capes Constantine and Peirce was attempted as a part of the annual Bering Sea resource assessment trawl survey. Sampling density was sparse on this first survey and the resulting catches were small to moderate. Sampling occurred just at the completion of the yellowfin sole fishery (early July), at a time when 60,000 mt of fish were recently caught. Biomass estimates are unavailable at this time to discern what portion of the total Bering Sea resource actually inhabits this area. Immigration, emigration, and residence time of yellowfin sole are also unknown for this area.

Given that the cause-and-effect relationship has not been firmly established between the presence of fishing vessels and the decline in the number of walruses hauled out on Round Island or the absence of vessels and the subsequent increase in walruses hauled out, it is not possible to quantify some of the factors relating to buffer zones and fishing closures. However, some qualitative analysis can be conducted on the value of long-term conservation of walruses in the face of uncertainty and

of the value of the Sanctuary as a unique recreational site. In addition, some of the costs that would be imposed under the various alternatives can be quantified in the extreme.

One means of comparing each alternative would be to compare the different impacts that could be expected. These impacts would include changes in: walrus haulout patterns, movements, health, and population size; the amount of yellowfin sole that would be harvested in northern Bristol Bay that could not be harvested elsewhere, the cost (and profit) between harvesting there and elsewhere, bycatch of other groundfish species and prohibited species, prohibited species bycatch and associated fishery season length, the overall amount of groundfish that might be harvested; and, the number of visitors to Walrus Islands and other walrus haulout areas, visitor expenditures, emotional satisfaction visitors would experience, and perception and emotional satisfaction the general public would experience.

3.3.1 Alternative 1: No action - protective measures expire.

Allowing the measures to expire, while technically the status quo, will result in a change from the past three years. There has been no groundfish activity proximate to the Walrus Islands and a greatly reduced level in northern Bristol Bay since 1988 due to the buffer zones and a variety of other reasons mentioned elsewhere in this document. Therefore, not renewing buffer zones with a seasonal closure will result in an increase in fishing activity and associated noise around the Walrus Islands.

Environmental

The presence of the fleet in northern Bristol Bay will bring the potential for increased fishery-related disturbance of walruses. If the decline in haulouts during 1987 and 1988 (Table 1) was related to fishery activity then a similar decrease would be expected again depending on fleet size and walrus tolerance. It is likely that the airborne and waterborne noise associated with the fishing activities of this alternative could continue to disturb walruses both in the water and hauled out onshore. The type of vessel operating in the fishery will change because of the change from joint ventures to domestic processing.

The effects of the reported disturbances to walruses are uncertain. If disturbance results in a redistribution of walruses on haulout sites within northern Bristol Bay or elsewhere to areas farther away, minor to major physiological impacts to individuals could result. If disturbance causes walruses to spend longer periods of time at sea or discourages them from hauling out entirely, individuals would be subjected to the higher energetic requirements associated with at-sea thermoregulation, behavioral stress, or interference with molting processes, resting, and physiological maintenance. It is possible that weakened and injured walruses would not be able to obtain needed rest in the spring. This might lead to higher mortality rates and a decrease in the walrus population. Thus, a significant portion of the regional walrus population could incur physiological impacts with probable, but unknown, population level effects. This could lead to adverse impacts on human use and the subsistence economy of Alaskan natives.

It is possible, although not probable, that a redistribution of walruses to haulout sites outside of northern Bristol Bay would result in beneficial effects on walruses. Walruses might move to formerly-used sites not now occupied or fully utilized. However, the areas suitable for hauling out by walruses

are extremely limited and probably could not accommodate large numbers of animals. Reoccupation of formerly used sites might result in discovery and redistribution of walrus feeding locations. If walruses were able to obtain adequate prey in these new areas, the food resources of current feeding areas in central Bristol Bay would not be subjected to current levels of grazing. However, it is considered highly unlikely that adequate food resources are available close to other sites because of the different bathymetry and oceanographic conditions of waters surrounding such sites. If walruses had to travel from other, more remote areas back to central Bristol Bay to feed, they would incur additional physiological costs likely resulting in adverse population effects.

Fishery impacts

In 1987-88 northern Bristol Bay was the preferred fishing grounds for yellowfin sole during the early summer, the same time as walruses are hauling out. As Figures 3 and 4 show, a large number of trawls for yellowfin sole were made in this area during May and June of 1987 and 1988 with most of the fleet moving west into Bering Sea waters in July and August. Comparable data for 1989 and 1990 are not available as discussed above.

For the combined harvests of 1986-88 (the three years for which data exists on yellowfin sole fishing inside Bristol Bay), 28% of the observed joint venture harvest of 50,509 mt occurred within this proposed 12-mile closure during the months of April-June. If it is assumed that the JVP observer coverage provides a representative sampling of fishing patterns and if this seasonal closure had been in effect over the period 1986-1988 and the fleet had not modified its behavior to increase its catch of yellowfin sole in other area, then the foregone catch and gross revenue to the fleet from this closure would have been:

Year	Foregone Catch (metric tons)	Exvessel Price[1] (dollars/mt)	Foregone Revenue (millions $)
1986	788	134	0.1
1987	11,393	145	1.7
1988[2]	23,740	165	3.9

[1]Annual average prices as reported by Pat Peacock, NMFS, Alaska Region, Juneau, 2/89.
[2]1988 catch figures are preliminary.

At the 1988 peak, about 24,000 mt of yellowfin sole, worth $4 million at the exvessel level, were taken in the 12-mile buffer zone. In future years this value will increase to the wholesale level due to domestic processing. This is the maximum benefit to be expected from reopening the area but is overstated for several reasons. The first is that much if not all of this yellowfin sole catch could be taken outside of the buffer zone and so would not be an increased benefit. The second is that revenues cover operating expenses that would not have accrued if fishing did not take place. Therefore the actual increase in benefits would be less than $4+ million. It is more likely that all of this amount of yellowfin sole would have been harvested elsewhere, possibly even within northern Bristol Bay. The increased benefit (or cost) is therefore the difference in overall profit between the two areas. As shown in Table 5 the catch per unit effort (CPUE) is actually greater outside of this 12-mile buffer. If travel and operating costs were the same in and outside the area then there might even be a potential monetary cost to the fleet if the area is opened and used.

Bycatch rates for PSC become lower as fishing moves away from Round and The Twins Islands (Table 4). This is true for an area six miles from the islands, from 6 to 12 miles from the islands, and from there to northern Bristol Bay as a whole. Possibly this is due to slightly different bottom topography associated with the islands. Therefore, fishing within the twelve mile zone is expected to result in increased PSC catch and, if PSC limits groundfish fishing, an earlier closure with lower overall harvests.

Another factor is the difference in bycatch of other groundfish species between the buffer zone and other areas. To the extent that harvests are made in northern Bristol Bay it does not seem that these bycatch rates would be dramatically different from those in the buffer zone. To the extent that this is true, the buffer zone does not create a benefit to the fleet.

There would be no new direct costs imposed on the fleet by allowing the protective measures to expire. In 1991 the yellowfin sole fishing season is scheduled to begin May 1. The number of vessels expected in this fishery is unknown. The domestic harvest of yellowfin sole has been very low in the past (Table 2). However, as pollock and cod seasons shorten and as other fishing opportunities are diminished more vessels and a larger harvest are expected in this fishery.

Socioeconomic impacts

If the number of walruses that haul out within the Sanctuary is affected by an increase in vessel traffic and continues to decline, then there could be a reduction in the value/appeal of Round Island as a site for the public to view walruses and conduct research and the number of visitors would be expected to decrease. Visitors could still choose the area in order to view seabirds, other marine mammals, or to engage in other recreational activities such as camping. It is assumed, however, that the main purpose of any visit is to view or study the walruses. Visitors in the past have commented negatively on the numbers of fishing vessels in the vicinity and the associated noise. They also stated that this was a negative aspect of their visit (Hessing 1991, personal communication). A reduction in the number of visitors will mean fewer dollars will be spent in local communities such as Dillingham and Togiak. Visitors' expenditures on food, lodging, and transportation had a direct impact on the tourism economy and an indirect impact on the overall economy of Alaska. No studies on this aspect of the Walrus Islands have been conducted.

The continued presence of fishing activity and noise reaching Round Island would decrease the feeling of remoteness for visitors to the Island and, if fishing moved westward, at Cape Peirce. If disturbance were affecting walrus haulout behavior, this would negatively impact the visitor's experience by decreasing the number of walruses on shore. Abandonment of the haulout sites is a possibility. These effects could have a major impact on visitor use of the Sanctuary and the Refuge, and the ability of the public to view walruses. There are no other areas in the U. S. where facilities allow visitors to go and observe walruses on coastal haulouts. Such an effect would have a fiscal impact on the Alaskan visitor industry, especially in Anchorage, Dillingham, and Togiak. The knowledge of such a reduction in walrus hauling out would also affect the perceptions of those people worldwide who are aware of the islands and take pleasure in that knowledge.

Allowing the buffer zones to expire would place the United States in the position of being much less restrictive concerning walrus haulouts than the Soviet Union. It is possible that world and national opinion might lead to reconsideration of this decision by forcing protective measures through another federal agency or through Congress.

3.3.2 Alternative 2: Establish permanent 12-mile radius buffer zones with seasonal groundfish fishery closures around three walrus haulout sites. An option would be to extend the closure for five years and continue studies on walrus/fishery interactions.

This alternative is arguably the status quo and would continue the regulatory measures already in place. Since no groundfish fishing operations have been allowed inside of the 12-mile radius since 1990, and few if any wholly domestic operations used it before then, fishermen will not suffer losses. The current level of protection offered the walruses would continue. Increased noise and fishing activity would still occur outside of the buffer zone as the fleet increases in size and would continue to interfere with walrus movements and behavior to that extent.

Environmental impacts

This alternative would provide a moderate level of protection for walruses by maintaining a disturbance buffer from commercial groundfish fisheries. The alternative maintains a 12-mile buffer zone with seasonal fishing closure around the three major walrus haulout sites in northern Bristol Bay. Increasing the distance between fishing vessels and walrus haulout sites is predicted to reduce through attenuation the amount of vessel-related waterborne sound reaching these locations. The degree of attenuation is dependent on numerous variables (physical properties of air and water such as wind and current speed, salinity, thermoclines, initial sound intensity, etc.) and cannot be predicted accurately. It is assumed that a 12-mile buffer zone would adequately reduce sound intensity to a level acceptable to walruses at least on and near haulout sites. The possibility still remains that walruses may encounter unacceptably high levels of noise from the fishery when approaching haulout sites from sea.

The 12-mile buffer would be consistent with the level of protection provided for walrus haulouts in the Soviet Union, the only other country which shares the Pacific walrus population. The establishment of the seasonal closure would affirm the U.S. commitment to the protection of marine mammals, as specified in the Marine Mammal Protection Act, and could generate some side benefits in future negotiations with other countries on the protection of other marine resources.

Groundfish fishing has not been observed from shore at Cape Peirce to date, although considerable yellowfin sole trawling has occurred offshore in adjacent Kuskokwim Bay. Protection for Cape Peirce is proposed because if restrictions were applied only to the Walrus Islands Sanctuary area, it is likely that fishing effort (and therefore acoustic disturbance) would increase adjacent to Cape Peirce.

As walruses approach northern Bristol Bay, they would encounter zones where fishing sounds were intense and concentrated and other areas where sounds were not as intense. The buffers proposed by this alternative would result in certain underwater areas having lower levels of fishery-related sounds; these would be larger than those that would occur with no buffer zone and a distribution of fishing effort close to the walrus haulouts. This would likely produce less disturbance to walrus moving through the region as they approach haulout sites and could maintain current numbers of walrus hauling out.

Fishery impacts

The current regulations prohibit groundfish fishing (and support operations) within twelve miles of Cape Peirce, Round Island, and The Twins. The other fishery activities which have occurred in those waters are tendering, processing, and other fishery support activities. All of these activities have been prohibited or greatly reduced during the past three years. Since continuation of the buffer zone

would not change industry activities from their present pattern and would impose no new constraints restricting current activities, the industry would not have costs imposed on it by continuation of these regulations. What the industry would lose is the opportunity to fish in those waters should they so desire. The CPUE estimates in 1986-88 were actually higher outside the buffer zone than in. All else equal, this would suggest that fishing costs are less outside the buffer area than inside it. Similarly, PSC catches are greater inside the zone than out.

Some fishing activities are likely to continue during April through September relatively close to walrus haulouts but outside the closure zones (in particular over the canyon between Round Island and the Nushagak Peninsula). Enforcement of the restriction on fishing the 12-mile zones would be complex because of their circular configuration. Fishing and enforcement vessels would have to monitor positions closely through radar or other means on a frequent basis. Vessels fishing in northern Bristol Bay may be tempted to "fish the curves" around each of the haulout sites in order to maximize the fishing area. This would result in point source sound propagation from locations immediately adjacent to the 12-mile closures. Activities during 1990 were not sufficient to tell whether this activity will occur in large numbers. However, the sinking of the foreign processor near the buffer zone suggests that it will.

In 1987 a large number of trawlers in the yellowfin sole fleet fished in the Kuskokwim Bay area west of Cape Peirce during the month of June (Figure 3). This is also a potential alternative harvesting area, which could help to offset any revenue lost from the 12-mile closure, if the fleet can successfully shift fishing to this area.

If the 12-mile protection is sufficient to maintain site fidelity for the walruses, and if their recent decline is attributable to disturbance caused by the yellowfin sole fishery within 12 miles, then the number of observed walruses could remain level or increase in future years. However, if the additive impacts of fleet encounters with walruses outside the Sanctuary (on the feeding grounds and enroute) are sufficient to disrupt the return of the walruses to the haulouts, or if there is no relationship between groundfish fishing activity and haulout declines, then there may be fewer benefits under this closure.

Socioeconomic impacts

Maintaining the 12-mile buffer zone would provide moderate assurance that the number of walrus hauling out would not decrease. It would also reduce airborne noise which disturbs visitors. Given this, visitors would continue to enjoy the walruses and serenity of the Sanctuary. If walrus numbers decrease due to at-sea impacts as mentioned above, then visitor enjoyment will decrease as will the public's perception of the Sanctuary.

Option of sunsetting the restrictions in five years

The costs and benefits described above would still exist if the restrictions were only put in place for five years. Five years is an adequate planning horizon for scientific studies since it allows time for proper funding, planning, staffing, and follow up. Most important, it is of minimal length to allow a time series of data to be collected.

The added benefits and costs are determined by whether or not the buffer is the proper size. If it is not the proper size, this option guarantees the Council will take the time to redress it. If it is the proper size then this option results in a less than optimal use of future Council and agency time.

3.3.3 Alternative 3: Establish a seasonal groundfish fishing closure north of a line from Cape Constantine to the southernmost tangent of a 12-mile radius around Cape Peirce. An option would be to institute the closure for only five years and continue studies on walrus/fishery interactions.

Environmental impacts

This alternative would provide a high degree of protection to walruses frequenting northern Bristol Bay haulout sites. By closing most of northern Bristol Bay to groundfish fishing from April 1 through September 30, the amount of airborne sound reaching haulout sites and the size of subsurface area ensonified would be reduced greatly. While the present buffer zone has coincided with an increase in the numbers of walrus hauling out since 1988, the number of walruses at haulout sites has not recovered to historic highs. This alternative would allow an evaluation of whether a larger buffer zone is necessary. Once walruses entered the northern portion of the Bay to approach traditional haulout sites, the intensity of sound would begin to attenuate.

By restricting groundfish fishing activities to a well defined, easily enforceable line, vessels would not be likely to approach haulout sites accidentally. Eliminating fishing activities from the previously heavily fished canyon area between Round Island and the Nushagak Peninsula would reduce the chance that fishery generated sounds would create an acoustic barrier to walruses moving toward Round Island or Cape Peirce from feeding areas in central Bristol Bay. Absence of fishing in this area would also mean processors and other fishery related activity likely would be located south of the closure line as well; reducing the chances that vessels would even enter the closure area to unload their catch. "Fishing the line" would result in the production of point source sounds spread out over a reasonably large area and emanating from locations more distant from important walrus haulouts. All of this would be beneficial to the walruses.

Fishery impacts

Since the principal groundfish fishery in this area is for yellowfin sole, this trawl fishery would be the major fishing category affected by the closure. Given that a significant portion of the yellowfin sole fishery has occurred in northern Bristol Bay in past years, this area will probably remain good trawling grounds for the yellowfin sole fleet.

By closing this area and forcing relocation of the fishing fleet, costs will be imposed in the form of increased travel time to new areas (i.e., fuel costs, opportunity costs such as lost fishing time) and perhaps reduced fishing opportunities if the substitute grounds have lower CPUEs.

If this seasonal closure had been in effect over the period 1986-1988 and the yellowfin sole fishing fleet had not modified its behavior to increase its catch of yellowfin sole in other areas, then the foregone catch and gross revenue to the fleet from this closure would have been:

Year	Foregone Catch (metric tons)	Exvessel Price[1] (dollars/mt)	Foregone Revenue (millions $)
1986	2,813	134	0.4
1987	4-.689	145	5.9
1988[2]	84,785	165	14.0

[1]Annual average prices as reported by Pat Peacock, NMFS, Alaska Region, Juneau, 2/89.
[2]1988 catch data are preliminary estimates based on observer data available as of 2/13/89.

Assuming that this fishery with its relatively high CPUEs and low bycatch remains attractive to the fleet then foregone catch in 1988 would have been 85,000 mt and lost gross exvessel revenues would have been $14 million. Since domestic processors will operate in the future the potential loss in gross revenues would be quite a bit higher. Again, net losses to the trawlers would be less if the catch is foregone and thus effort and fishing costs are reduced, or if the fleet was able to harvest its portion of yellowfin sole at an alternate area or time, but at increased cost.

It is possible that the fleet could harvest the entire yellowfin sole quota elsewhere. If this were the case then the cost would be the increased costs associated with fishing activity. Table 5 shows that in both 1986 and 1988 the average CPUE was significantly higher outside the proposed closure rather than inside. If this were the case then, all else equal, the fleet would suffer loses by using the closed area. However, PSC rates are higher outside the proposed closure area (Table 4) and this has resulted in fishery closures in the past. It is not clear whether these rates will be restrictive with a solely domestic fleet due to different bycatch rates and fishing techniques.

Socioeconomic impacts

Maintaining the larger closure area would provide the greatest assurance that the number of walruses hauling out would not decrease. It would also reduce airborne noise which disturbs visitors. Given this, visitors would continue to enjoy the walruses and serenity of the Sanctuary.

Option of sunsetting the restrictions in five years

The benefits and costs of the sunset option are the same as for Alternative 2.

3.4 Benefit-Cost Conclusion

Allowing the buffer zone to expire, Alternative 1, carries a possible cost to walruses if fishing activity did cause them to avoid preferred haulouts in 1987-88. It costs visitors to the Walrus Sanctuary due to increased noise and activity. It presents few if any benefits to the fishing fleet since any new fishing possibilities are probably equal to those occurring outside the area.

The continuation of the buffer zone, Alternative 2, gives moderate possible protection to walruses, continued benefits to visitors and the public from reduced interference, and marginal if any costs to the fishing fleet.

The institution of the large closure, Alternative 3, gives the highest possible protection to walruses, no significantly greater benefits to visitors than from Alternative 2, and higher, although non-quantifiable, costs to the fishing fleet.

Currently, three main user groups compete for access to this area: the commercial trawl fleet, walruses, and visitors. The commercial trawl fleet is not significantly impacted by the presence of the other two groups. Visitors are positively impacted by the presence of walruses. The direct impact of the fleet on visitors would be mainly in the form of increased noise/activity. Indirectly, the fleet could also be contributing to a reduction in the number of walruses hauling out. Both of these effects would be negative, from the viewpoint of visitors. Presumably, the presence of either human user group would diminish the attractiveness of the site to the walruses and could affect their use of the site.

The State of Alaska closely regulates the use of this area by visitors in an attempt to balance the demands of this user group with concern for the impact of their presence on the walruses. Round Island and Cape Peirce are unique recreational sites; there is not a substitute for the viewing experience afforded there. It is difficult to place a value on the experience of viewing wildlife in their natural setting with little indication of human interference. Given that the economic benefits which accrue from in situ conservation of a preserved natural area and a stock are hard to quantify, they are seldom acknowledged in benefit-cost analyses. As a result, usually the true economic value of the site is underestimated (Oldfield, 1984).

It is also hard to quantify what, if any, benefit will accrue to the walruses under the three alternatives. There are considerable difficulties with monitoring of the walrus population and these monitoring efforts only provide general trends in population sizes, rather than reliable estimates of actual numbers.

Given the uncertainty of the impacts of the fishing fleet on the walruses, and given the risk of being unable to detect major fluctuations in the walrus population until after the fact, one must acknowledge that there is a cost attached to "guessing" wrong. Some benefit might be gained in erring on the side of conservation, especially if it can be done without imposing a substantial cost on the fishing industry.

3.5 Reporting Costs

No significant change in reporting or paperwork costs are anticipated under any of these alternatives.

3.6 Administrative, Enforcement, and Information Costs

Under Alternatives 2 and 3, added enforcement costs would be expected as currently there exist no ongoing aerial and sea surveys of this area. If such surveys were to be implemented to monitor enforcement of the closed area, they could be expected to run about $17,500 per month (this assumes one flight per month with a C-130 which would require about 5 hours flight time at $3,500 per hour). The Sanctuary is already monitored by the State of Alaska for visitor access to the islands.

3.7 Distribution of Costs and Benefits

To the extent that the costs and benefits can be measured, they apply to the various user groups differently under the various alternatives. Under Alternative 1, allowing the protective measures to expire, the benefit, if any, will be to the trawl fleet. Under this alternative the fleet will retain access to the fishing grounds during the months of April through September. The costs under this alternative will be borne by the walrus population, should interference with haulout or other activities occur, and on visitors and the public at large as a result of a negative externalities from the noise

associated with fleet activity and from any decrease in the numbers of walruses hauling out and the decrease in satisfaction and research this brings.

Under Alternatives 2 and 3, the costs will fall directly on the commercial fleet in the form of either foregone catch and revenues or increased costs due to the displacement of one sector of the fleet from preferred fishing grounds. If the measures in Alternative 2 are not sufficient to ensure that walruses can utilize the northern Bristol Bay area and haulouts without interference then costs would also be borne by the walrus population and, to a lesser extent, by visitors and the public at large.

APPENDIX I TO CHAPTER 3

Commercial Salmon and Herring Fisheries of Northern Bristol Bay

The following provides a synopsis of the salmon and herring fisheries in the Togiak area of northern Bristol Bay between Cape Constantine and Cape Newenham. Since these fisheries are wholly conducted within the State of Alaska's three-mile territorial zone, the Council has no regulatory authority over them. However, there are several hundred vessels associated with each of several herring and salmon fisheries, and the disturbance to walruses from these fisheries has not been included in this analysis. Since the vessels are much smaller than the trawlers discussed in previous sections of this analysis, the disturbance is therefore believed to be less. Nonetheless, it is recognized that even if the Council takes action to regulate trawling to minimize walrus disturbance, such action will not reduce or otherwise affect the conduct of the salmon and herring fisheries in the area.

Herring Fishery

The Bristol Bay domestic commercial sac-roe and roe-on-kelp fisheries began in the 1960s, but remained at very low levels until passage of the Magnuson Fishery Conservation and Management Act provided the opportunity for these fisheries to expand by reducing foreign harvests. Prior to 1978, the domestic fishery was allowed to develop without regulatory restrictions imposed by the State of Alaska. Since then, regulatory measures have been adopted concerning seasons and fishing periods, gear specifications, boundaries, and catch reporting to ensure that harvests do not exceed quotas. Quotas are generally established at twenty percent of the available biomass. The fishery occurs over about a ten day period each Spring between late April and late May. The fishery has been managed via emergency order announcements since 1981. A regulatory management plan has been developed to take into consideration variable exploitation rates on young versus older year class herring. There is also a herring roe-on-kelp fishery conducted within designated intertidal areas.

The fishery is conducted in nearshore areas between Kulukak Bay and Cape Newenham (Figure A). Beginning with the 1988 season, the gillnet fishery was restricted to the east of Togiak Bay and the seine fishery was restricted to Togiak Bay and areas to the west. However, these restrictions were abolished in 1990. Gillnet boats generally range in size from open skiffs to 32-foot "salmon" vessels. Seine boats range in size from 32-foot "salmon" vessels to 68-foot limit seiners.

This herring fishery is not a limited entry fishery. Fishing effort levels have remained relatively stable during the past five years while there has been a general decline in harvest which is expected to continue due to the present age structure of the population (high fraction of very old age herring with very low recruitment of younger fish). Fishing vessel effort and catch levels for the period 1984 through 1988 are as follows:

Year	Processors	Purse Seine	Gillnet	Catch (tons)
1984	25	196	300	19,300
1985	23	155	302	25,616
1986	23	209	209	16,260
1987	18	111	148	15,204
1988	22	239	300	13,986
1989	19	310	320	12,258
1990	16	221	277	8,792

Salmon Fisheries

The Bristol Bay commercial salmon fishery began in the 1880s. Commercial fishing is limited to drift and set gillnet gear types fished in five discrete fishing districts (Figure B) which are positioned off the mouths of major rivers. Approximately 1,800 drift and 900 set gillnet limited entry permits have been issued for Bristol Bay, essentially all of which are fished each year. Both gear types are allowed to move from district to district throughout the season, so effort levels within any single district vary within season and between years.

The commercial salmon fishery did not begin in the Togiak District until the 1950s. This district is characterized by smaller salmon runs. Consequently, both effort and catch levels are relatively low compared to other districts within Bristol Bay. Drift gillnet effort accounts for about 68% of the harvest. Drift gillnet peak effort levels are generally between fifty and one hundred vessels, although effort levels may reach nearly two hundred for very short periods. Drift gillnet boats range in size up to a maximum of 32 ft. There are about 36 setnet units which fish in Togiak District.

The primary salmon species caught are sockeye and chum, however, significant numbers of chinook, coho, and pink salmon are also caught during a season that typically extends from the first of June into mid September with peak catches occurring in July. Catches for the period 1984 through 1988 are as follows:

Year	Sockeye	Chinook	Chum	Pink	Coho
1984	319,000	22,000	339,000	21,000	171,000
1985	210,000	37,000	206,000	341	39,000
1986	304,000	20,000	270,000	25,000	48,000
1985	340,000	18,000	422,000	24	1,000
1988	822,000	16,000	471,000	57,000	19,000
1989	89,000	11,300	203,000	170	56,000
1990	237,000	12,200	115,700	9,000	2,700

Literature Cited

Alaska Department of Fish & Game (ADF&G). 1991. 1990 Round Island report. Anchorage, Ak.

Brueggeman, J.J., C.I. Malme, R.A. Grotefendt, D.P. Volsen, J.J. Burns, D.G. Chapman, D.K. Ljungblad, and G.A. Green. 1990. Shell Western E & P Inc. 1989 walrus monitoring program: the Klondike, Burger, and Popcorn prospects in the Chukchi Sea. Final Report by EBASCO Environmental to Shell Western E & P, Inc., Houston, TX.

Davis, R.A., W.J. Richardson, L. Thiele, R. Dietz, and P. Johansen. 1990. State of the Arctic environment report on underwater noise. Finnish initiative on protection of the Arctic environment. Greenland Environmental Research Institute, Copenhagen, Denmark.

Gol'tsev, V.N. 1968. Dynamics of coastal walrus herds in connection with the distribution and numbers of walruses. *In*: V.A. Arsen'ev and K.I. Panin, eds. Lastonogie severnoi chasti Tikogo Okeana. Pischevaya Promyshlennost, Moscow, USSR.

Fay, F.H. 1985. Odobenus rosmarus. Mammalian species account. Am. Soc. Mamm. No. 238:1-7.

Fay, F.H., B.P. Kelly, and B.A. Fay (eds). 1990. The ecology and management of walrus populations--report of an international workshop. Final Report to U.S. Marine Mammal Commission, Washington, D. C.

Fay, F. 1991. Personal communication, April 5, 1991. University of Alaska, Fairbanks, AK.

Frost, K.J., L.F. Lowry, and J.J. Burns. 1983. Distribution of marine mammals in the coastal zone of the Bering Sea during summer and autumn. *In*: Environ. Assess. Alaskan Cont. Shelf, Vol. 20. Final Rep. Princ. Invest. BLM/NOAA, OCSEAP. Juneau, Ak.

Funk, F. 1991. Personal communication, March 12, 1991. Alaska Dept. of Fish & Game, Juneau, Ak.

Hessing, P. 1991. Personal communication, March 14, 1991. Alaska Dept. of Fish & Game, Anchorage, Ak.

Hills, S. 1991. Personal communication, March 13, 1991. U. S. Fish & Wildlife Service, Fairbanks, Ak.

Johnson, S. 1991. Personal communication, March 22, 1991. LGL Environmental Research Assoc., Sidney, B.C. Canada.

Lay, S. 1989. "Resting in peace". Backpacker Mag. Vol. 17, Issue 92(3):24-29.

LGL Ecological Research Associates (LGL). 1989. Synthesis of information on the effects of noise and disturbance on major haulout concentrations of Bering Sea pinnipeds. Final report to U.S. Minerals Management Service, MMS# 88-0092. Anchorage, Ak.

LGL. 1991. W.J. Richardson (ed.), Effects of noise on marine mammals. OCS Study MMS 90-0093. Rep. from LGL Ecol. Res. Assoc. Inc., Bryan, Tx, for U.S. Minerals Manage. Serv., Reston, Va.

Malme, C.I., P.R. Miles, G.W. Miller, W.J. Richardson, D.G. Roseneau, D.H. Thomson, and C.R. Green Jr. 1989. Analysis and ranking of the acoustic disturbance potential of petroleum industry activities and other sources of noise in the environment of marine mammals in Alaska. Final Report by BBN Systems and Technologies Corporation to U.S. Minerals Management Service, Anchorage, AK.

Marine Mammal Commission (MMC). 1991. Personal communication, April 4, 1991. Washington, D.C.

Møhl, B. 1968. Auditory sensitivity of the common seal in air and water. J. Aud. Res. 8:27-38.

Narita, R. 1991. Personal communication, March 13, 1991. NMFS observer program, Seattle, Wa.

Nichols, J. 1991. Personal Communication, May 8, 1991. U.S. Fish and Wildlife Service, Anchorage, Alaska.

North Pacific Fishery Management Council (NPFMC). 1989. Amendments 18 and 13 to the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish Fishery Management Plans and associated Environmental Assessment/Regulatory Impact Review/ Initial Regulatory Flexibility Analysis. Anchorage, Ak.

NPFMC, Bering Sea/Aleutian Islands Groundfish Plan Team. 1990. Stock Assessment and Fishery Evaluation Document for Groundfish Resources in the Bering Sea/Aleutian Islands Region as Projected for 1991. Anchorage, Ak.

Oldfield, M.L. 1984. The value of conserving genetic resources. U.S. Dept. Interior, National Park Service, Washington, D.C.

Popov, L. 1991. Personal communication to D. Seagars, USFWS. VINRO, Moscow, USSR.

Richardson, W.J. and C.I. Malme. 1991. Zones of noise influence. p. 262-329. *In*: W.J. Richardson (ed.), Effects of noise on marine mammals. OCS Study MMS 90-0093. Rep. from LGL Ecol. Res. Assoc. Inc., Bryan, Tx, for U.S. Minerals Manage. Serv., Reston, Va.

Seagars, D.J. 1989. U.S. Fish and Wildlife Service. Testimony to North Pacific Fishery Management Council, June 22, 1989. Anchorage, Ak.

Seagars, D.J. 1991. Personal communication, March 15, 1991. U. S. Fish & Wildlife Service, Anchorage, Ak.

Seagars, D.J., S.L. Schliebe, and J. Warburton. 1989. Monitoring the US harvest of Pacific walrus: 1980-1989. 8^{th} Biannual Conf. on the Biology of Marine Mammals, Pacific Grove, Ca. Dec. 7-11, 1989.

Sheffield, G. 1990. Daily log on Round Island. Alaska Dept. of Fish & Game, Dillingham, Ak.

Taylor, K. 1989. Alaska Dept. of Fish & Game. Testimony to North Pacific Fishery Management Council, June 21, 1989. Anchorage, Ak.

Terhune, J.M. and K. Ronald. 1972. The harp seal, *Pagophilus groenlandicus* (Erxleben, 1777). III. The underwater audiogram. Can. J. Zool. 50:565-569.

Terhune, J.M. and K. Ronald. 1975. Underwater hearing sensitivity of two ringed seals (*Pusa hispida*). Can. J. Zool. 53:227-231.

Thiele, L., A. Larsen, and O.W. Nielsen. 1990. Underwater noise exposure from shipping in Baffin Bay and Davis Strait. Rpt 87.184, Ødegaard & Danneskiold-Samsøe ApS. Copenhagen, Denmark.

U. S. Fish & Wildlife Service (USFWS). 1991. Unpublished data. Anchorage, Ak.

Urick, R.J. 1983. Principals of Underwater Sound. 3rd Edition. McGraw Hill, New York, NY.

Table 1

Summary of Maximum Walrus Haulout Numbers from Cape Peirce and Round Island, 1978-1990.

Year	Cape Peirce Maximum	Round Island Maximum
1978		15,000
1979		N/A
1980		11,603
1981		7,387
1982[1]		11,000+
1983		N/A
1984[2]	9,450	6,000+
1985	12,548	2,857
1986	9,494	12,378
1987	6,249	5,300
1988	6,938	4,424
1989	2,436	7,792
1990	1,474	6,891

Source: USFWS files except as noted below.
1 ADF&G files. In: LGL, 1989.
2 Round Island data: ADF&G files. In: LGL, 1989.

Table 2 Annual catches (mt) of yellowfin sole in the eastern Bering Sea, 1977-90.

		Domestic		
Year	Foreign	JVP	DAP	Total
1977	58,373		0	58,373
1978	138,433		0	138,433
1979	99,017		0	99,017
1980	77,768	9,623	0	87,391
1981	81,255	16,046	0	97,301
1982	78,331	17,381	0	95,712
1983	85,874	22,511	0	108,385
1984	126,762	32,764	0	159,526
1985	100,706	126,401	0	227,107
1986	57,197	151,400	0	208,597
1987	1,811	179,613	4	181,428
1988	0	213,323	9,833	223,156
1989	0	151,501	1,664	153,165
1990[1]	0	69,677	16,002	85,679

[1] Preliminary estimates from the NMFS Observer program as of January 16, 1991.

Sources: NPFMC, Bering Sea/Aleutian Islands Groundfish Plan Team. 1990. Stock Assessment and Fishery Evaluation Document for Goundfish Resources in the Bering Sea/Aleutian Islands Region as Projected for 1991. 209 pp.
Ren Narita, 1991. Pers. Comm. NMFS, Observer Program, February 1991.

Table 3 Comparison of the harvest levels between Capes Peirce and Constantine to the total Bering Sea harvest of yellowfin sole, 1986-90, in metric tons.

Year	Catch in subarea	Total harvest Bering Sea	Percentage of Total harvest
1986	2,813 mt	208,597 mt	1.3%
1987	40,689 mt	181,428 mt	22.0%
1988	84,785 mt	223,156 mt	37.9%
1989	0 mt	153,165 mt	0%
1990[1]	0 mt	85,679 mt	0%

[1] Preliminary estimates from the NMFS Observer program as of January 16, 1991.

Sources: NPFMC, Bering Sea/Aleutian Islands Groundfish Plan Team. 1988. Final Resource Assessment Document for the 1989 Bering Sea/Aleutian Islands Groundfish Fishery. 236 pp.
Ren Narita, 1991. Pers. Comm. NMFS, Observer Program, February 1991.

Table 4
Observed Joint Venture Bycatch Rates of Prohibited Species, 1987 and 1988, in the Bering Sea, Northern Bristol Bay, and Zones Surrounding Round and The Twins Islands.

	1987				1988			
	Salmon	Halibut	Tanner crab	King crab	Salmon	Halibut	Tanner crab	King crab
Within Six Miles of Round and The Twins Islands								
Mean number/mt	.000	.389	.000	.019	.001	.113	.000	.023
Avg. kg/indiv.	(6.525)	(2.084)	(0.000)	(0.822)	(3.233)	(5.133)	(0.000)	(0.543)
Within Twelve Miles of Round and The Twins Islands [1]								
Mean number/mt	.001	.302	.002	.016	.000	.084	.002	.017
Avg. kg/indiv.	(7.889)	(2.364)	(0.342)	(1.031)	(3.233)	(4.458)	(0.129)	(0.805)
Northern Bristol Bay [2]								
Mean number/mt	.000	.232	.003	.008	.000	.050	.029	.008
Avg. kg/indiv.	(7.894)	(2.781)	(0.303)	(1.054)	(5.163)	(6.294)	(0.077)	(0.853)
Bering Sea except N. Bristol Bay								
Mean number/mt	.014	1.772	1.616	.162	.000	.487	1.151	.369
Avg. kg/indiv.	(3.441)	(2.978)	(0.067)	(1.169)	(3.260)	(5.236)	(0.112)	(1.015)
All Areas Combined								
Mean number/mt	.006	.890	.685	.074	.000	.231	.494	.158
Avg. kg/indiv.	(3.602)	(2.948)	(0.067)	(1.161)	(4.782)	(5.370)	(0.111)	(1.011)

Notes: 1 Includes all observations from within six miles.
2 Encompasses an area from Cape Constantine to the southernmost tangent of a 12-mile radius around Cape Peirce including all perviously reported observations from within twelve miles.

Source: Ren Narita, 1991. Personal communication. NMFS, Observer Program, March, 1991.

Table 5 Summary of Yellowfin sole catch information when observers were present, 1986-1989.

WITHIN 12 MILES OF THE WALRUS ISLANDS

Year	Total catch (mt)	Mean CPUE (mt/hr)[1]	CPUE Range(mt)	n[2]
1986	684.1	4.8	1.25-8.3	43
1987	11,866.5	17.4	1.37-289.1	525
1988	1,736.1	7.9	1.23-33.2	96
1989	0.0	0	0	0

INSIDE BRISTOL BAY BUT OUTSIDE 12 MILES OF THE WALRUS ISLANDS

Year	Total catch (mt)	Mean CPUE (mt/hr)[1]	CPUE Range(mt)	n[2]
1986	533.7	6.1	2.3-13.4	30
1987	19,439.5	27.4	1.5-359.0	875
1988	3,586.5	7.9	1.8-27.1	181
1989	0.0	0	0	0

TOTAL BERING SEA FISHERY

Year	Mean CPUE (mt/hr)[1]	CPUE Range (mt)	Catch Range(mt)	n[2]
1986	13.9	0.1-316.1	1.2-67.1	3,702
1987	18.7	0.1-359.0	2.2-78.4	4,047
1988	15.3	1.1-242.6	2.1-78.6	2,603
1989	72.6	0.2-968.4	0.7-785.0	3,869

[1] Weighted by the size of the catch.
[2] Number of observations.

Sources: Jerry Berger, 1989. Pers. Comm. NMFS, Observer Program, February 1989.
Ren Narita, 1991. Pers. Comm. NMFS, Observer Program, February 1991.

Figure 1

Northern Bristol Bay

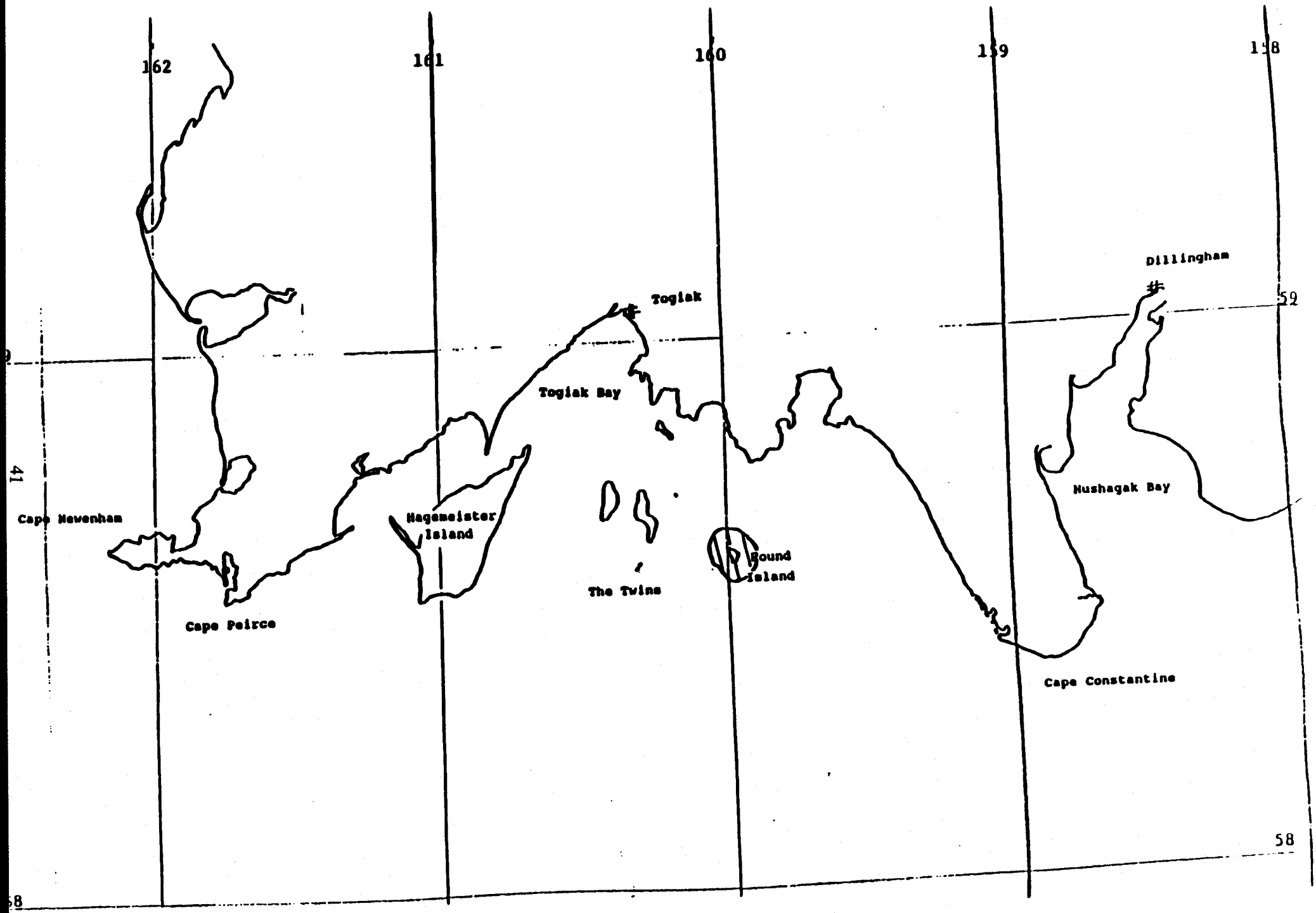
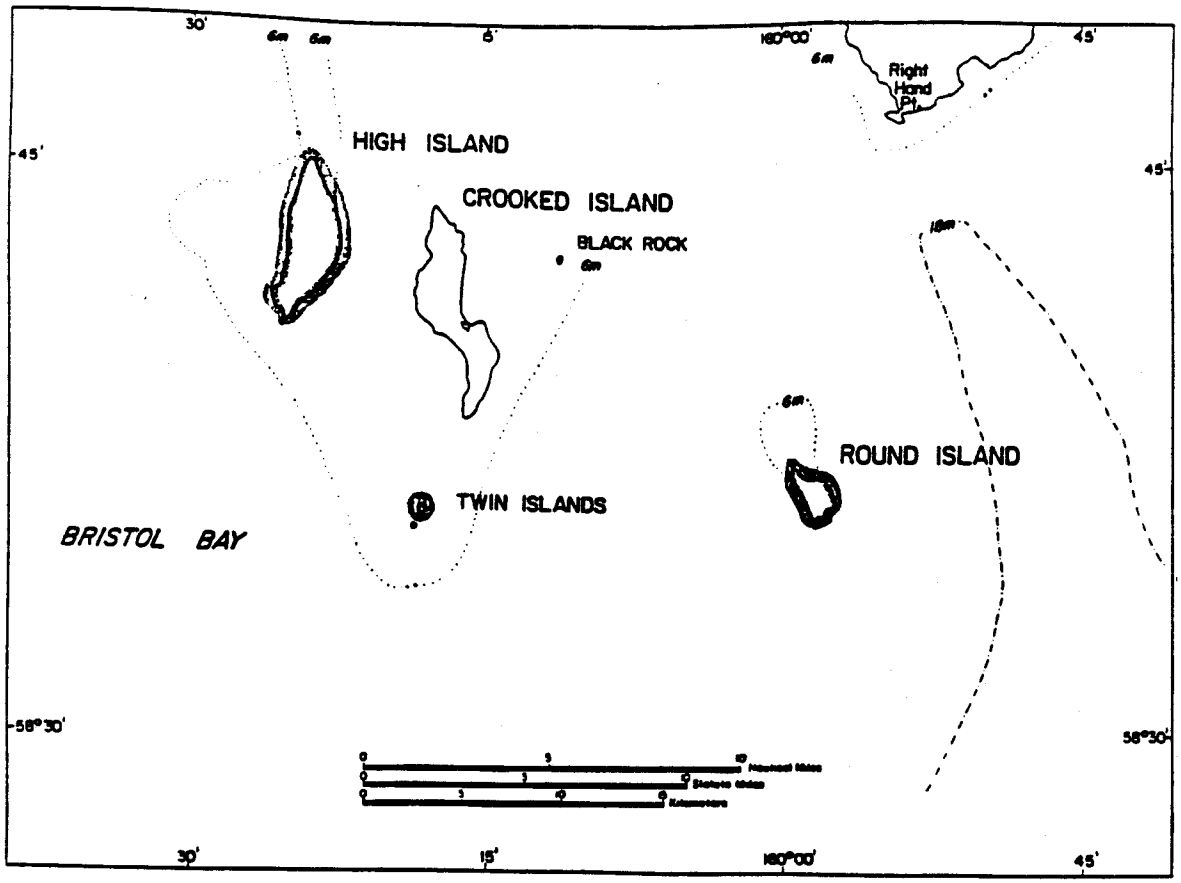
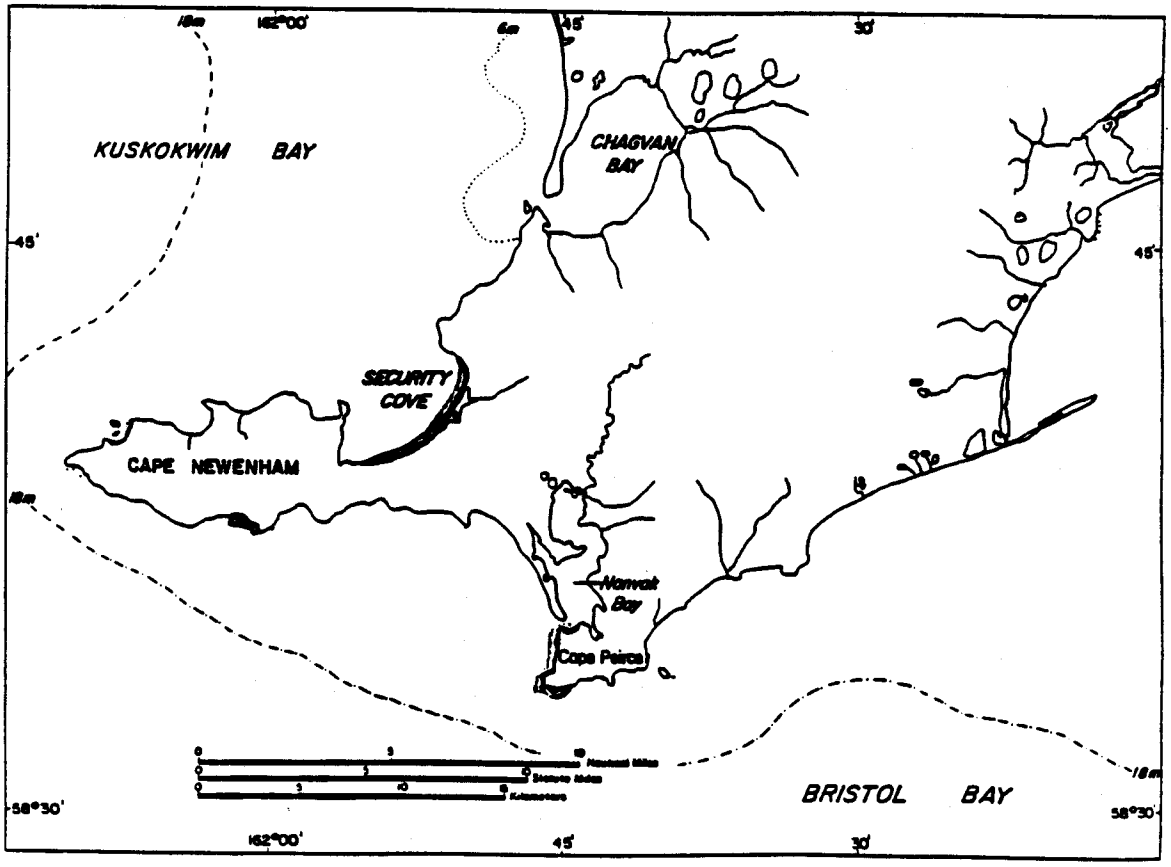


Figure 2
Northern Bristol Bay
Walrus Haulout Location





Source: LGL, 1989

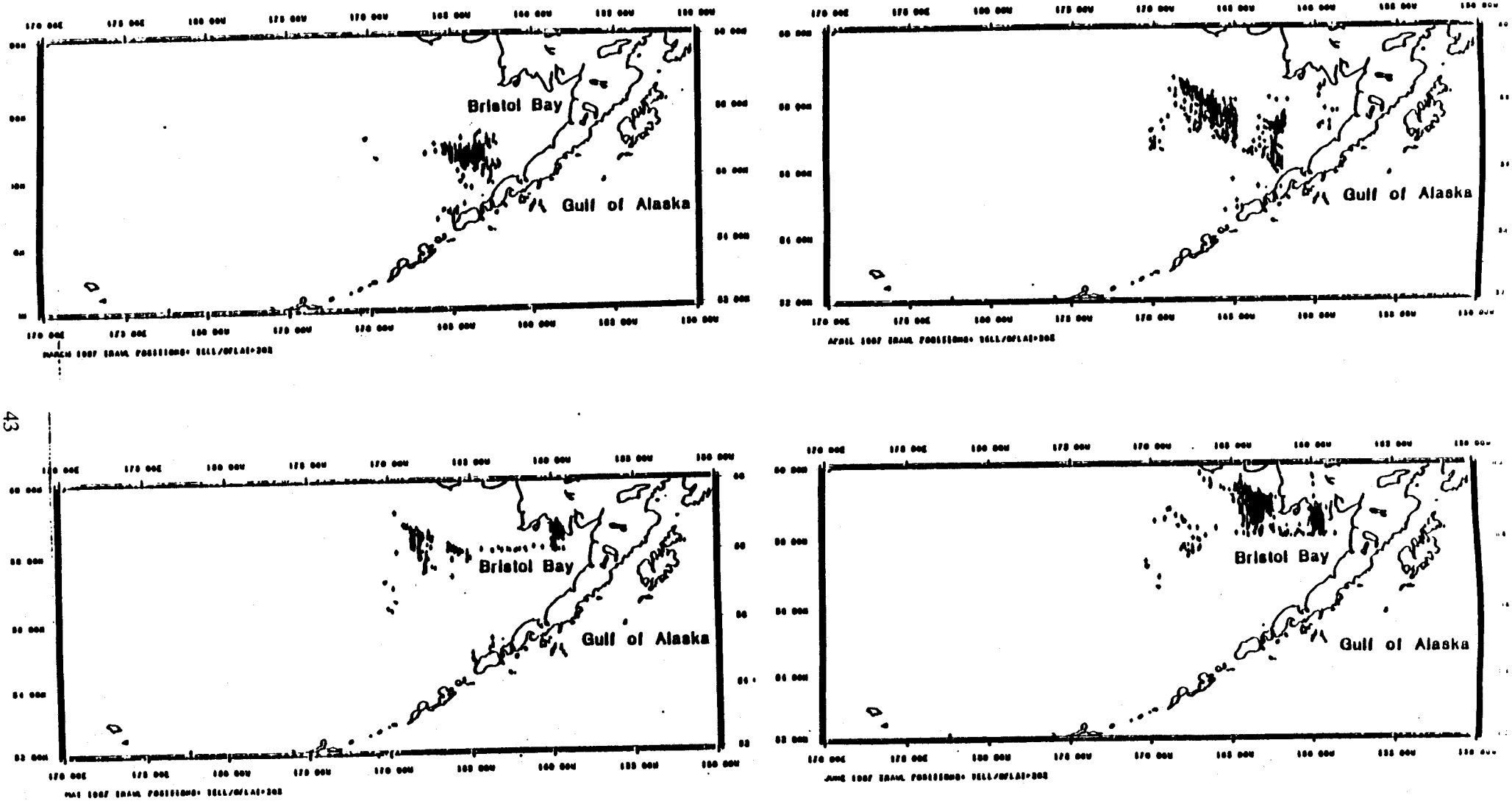


Figure 3 Figures showing the locations of joint venture catches where yellowfin sole comprised greater than 20% of the total catch weight during March through June 1987.

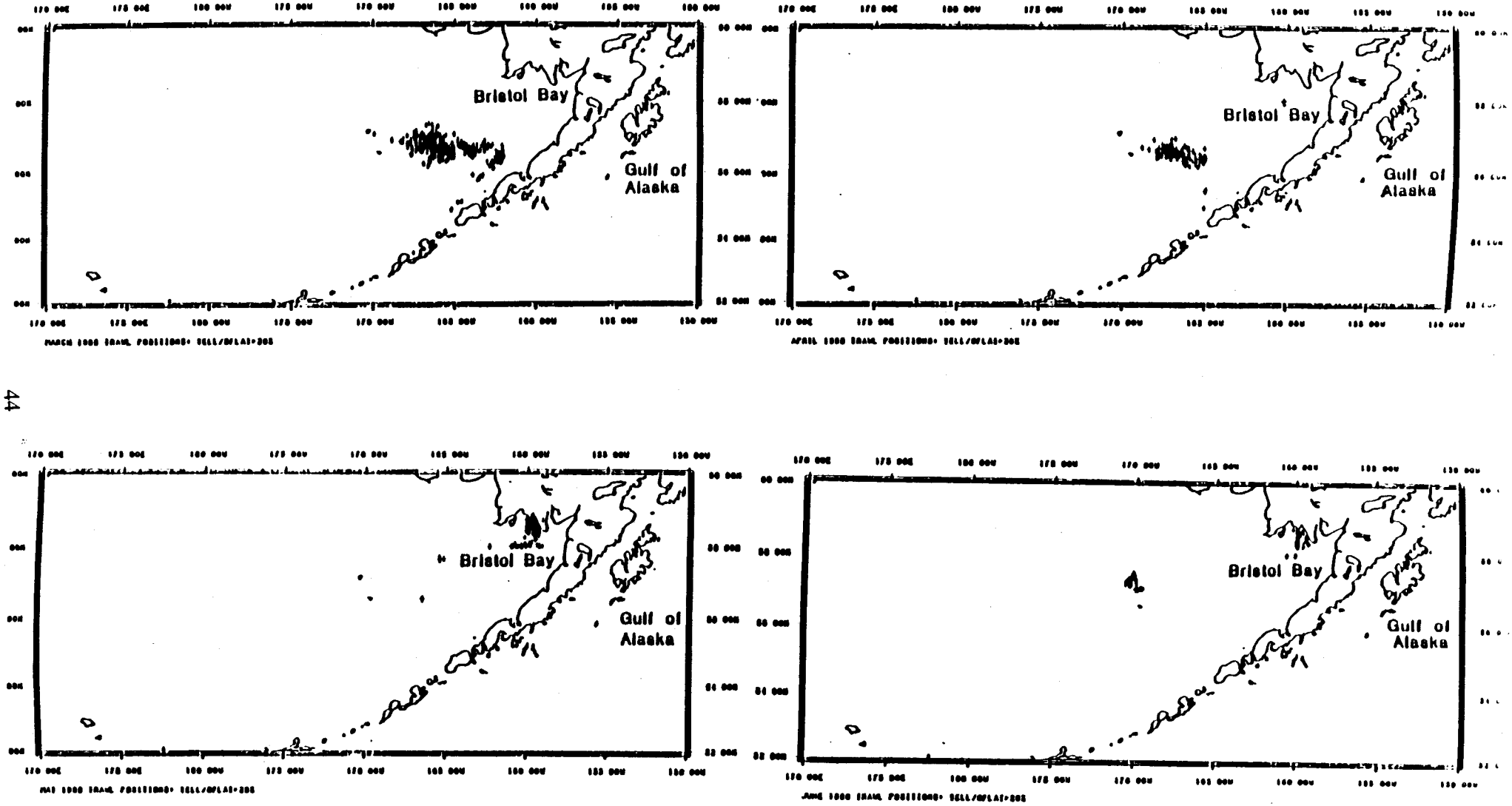


Figure 4 Figures showing the locations of joint venture catches where yellowfin sole comprised greater than 20% of the total catch weight during March through June 1988.

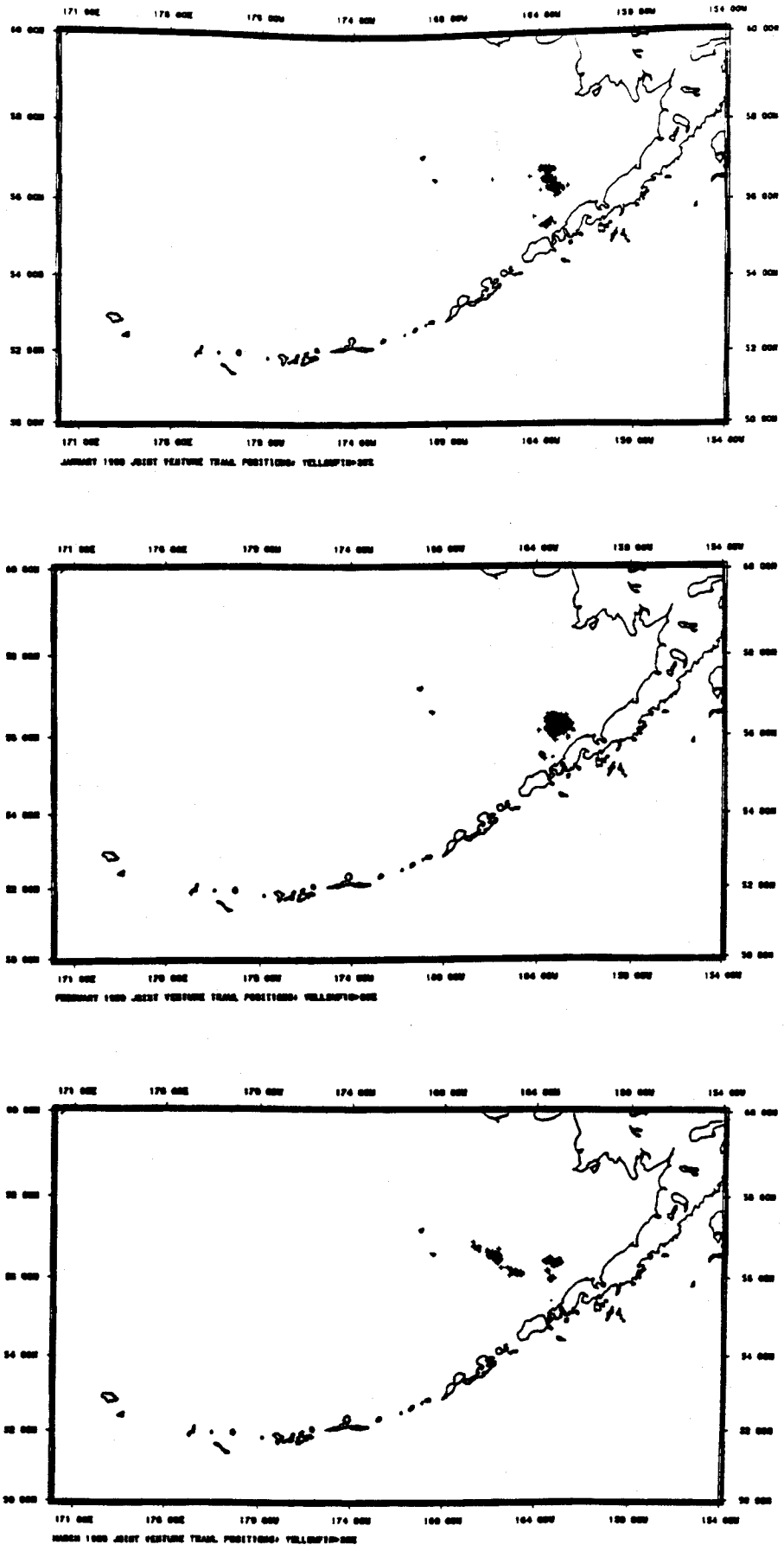


Figure 5 Figures showing the locations of joint venture catches where yellowfin sole comprised greater than 20% of the total catch weight during January through March 1989.

Figure 6 Figures showing the locations of joint venture catches where yellowfin sole comprised greater than 20% of the total catch weight during September through December 1989.

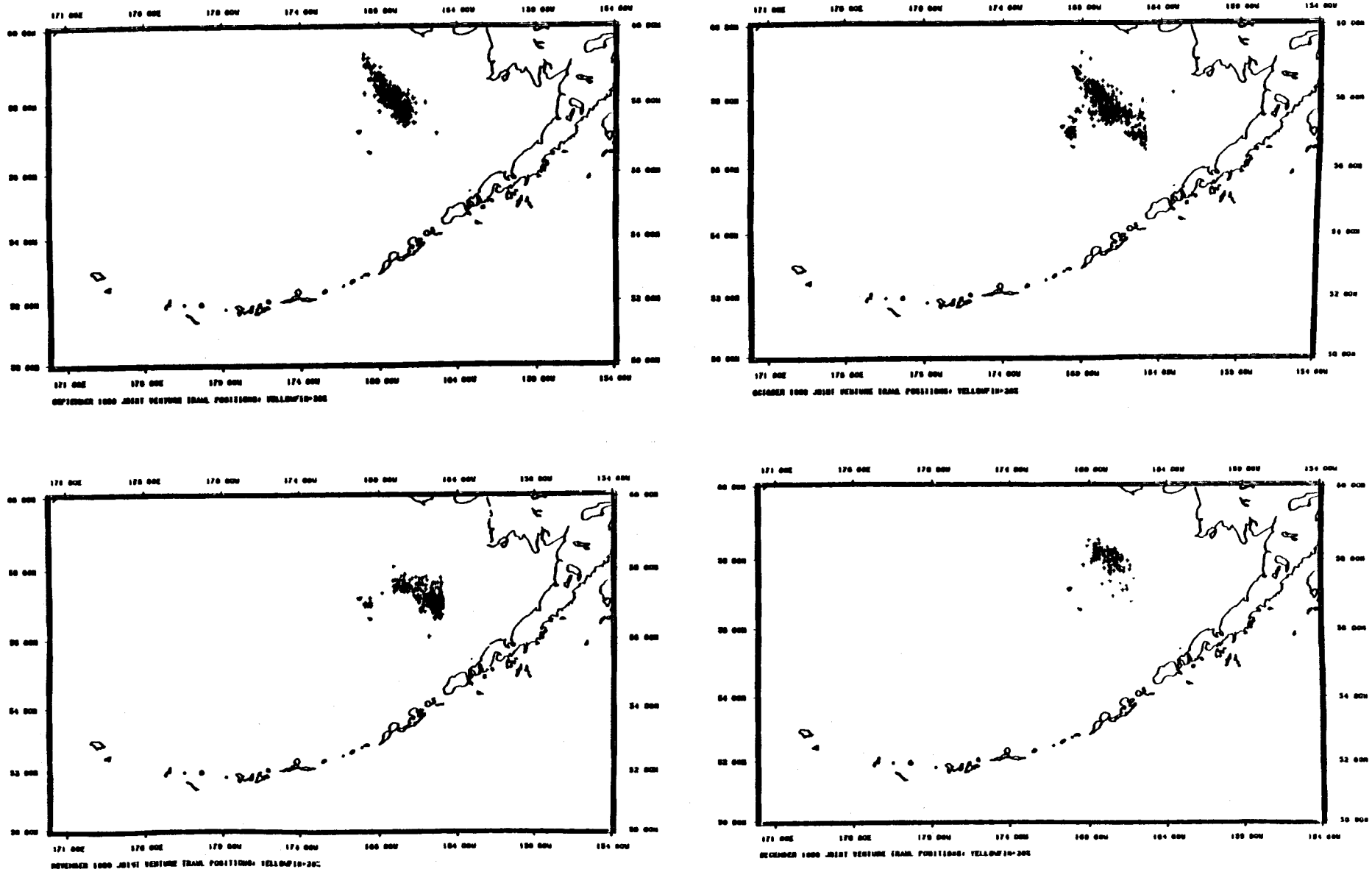
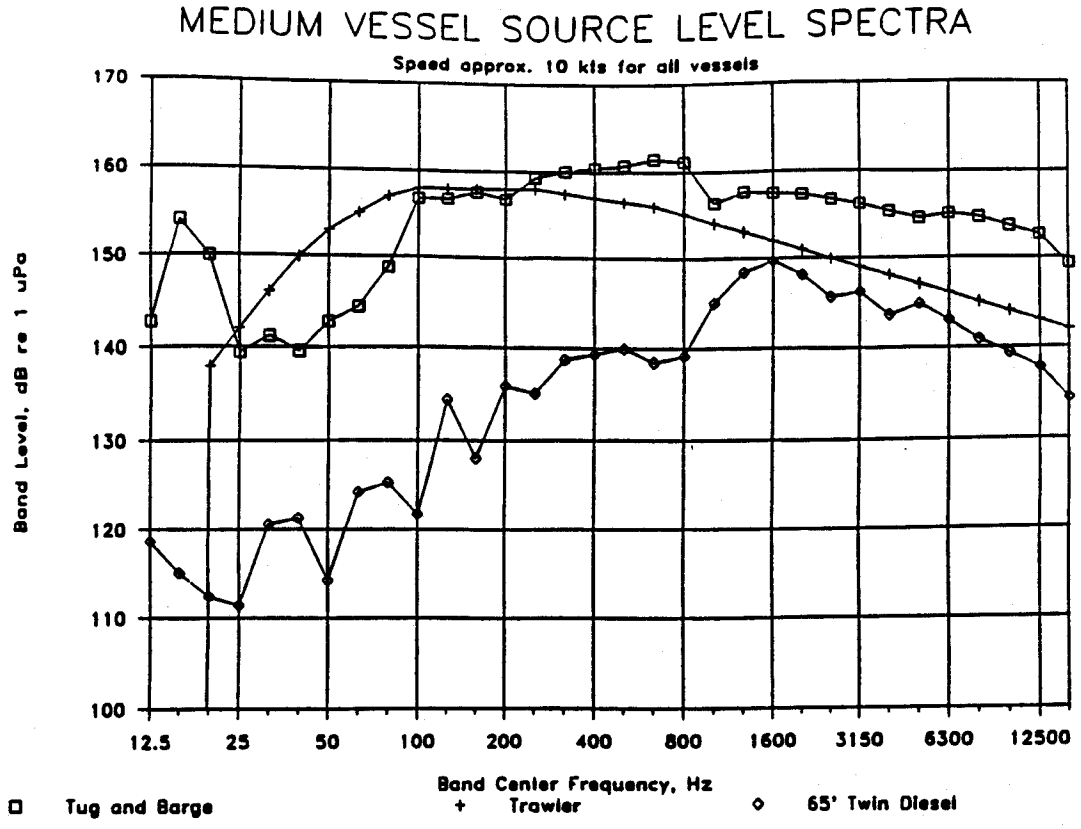
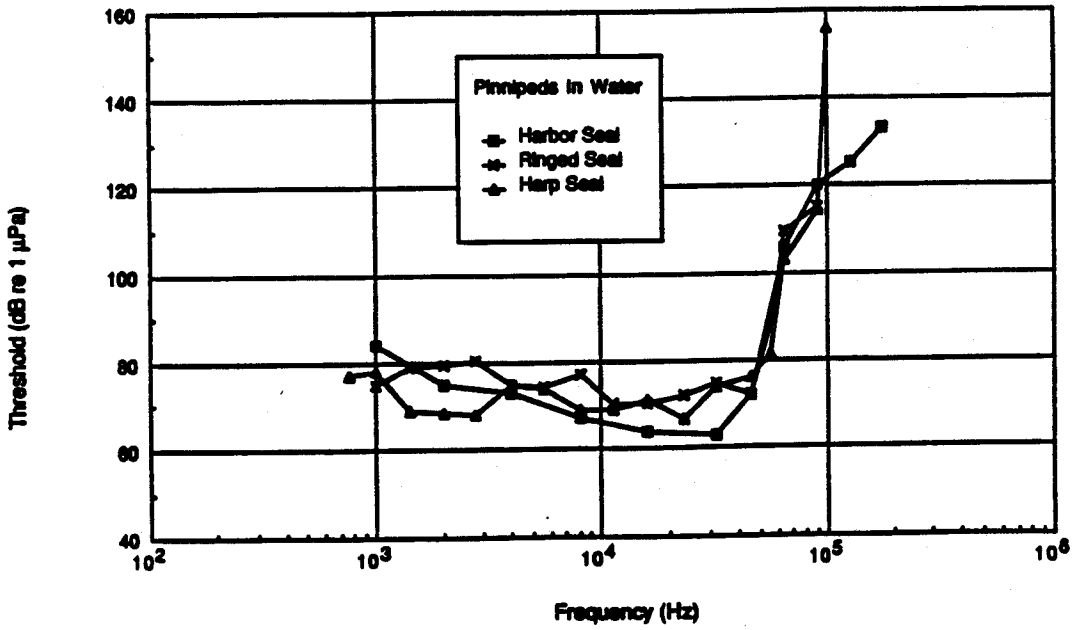


Figure 7 Underwater Radiated Noise with Fully Cavitating Propellers



From: LGL, 1989

Figure 8 Underwater Audiograms of Several Pinnipeds



Underwater audiograms of several pinnipeds: harbour seal (Mohl 1968a); average of two ringed seals (Terhune and Ronald 1975); harp seal (Terhune and Ronald 1972). In: Davis et al, 1990

Figure 9 ALTERNATIVE 2 - Twelve-mile groundfish fishing closure around Round Island, The Twins, and Cape Peirce. (Closure extends 9 miles seaward from the State's three mile limit.)

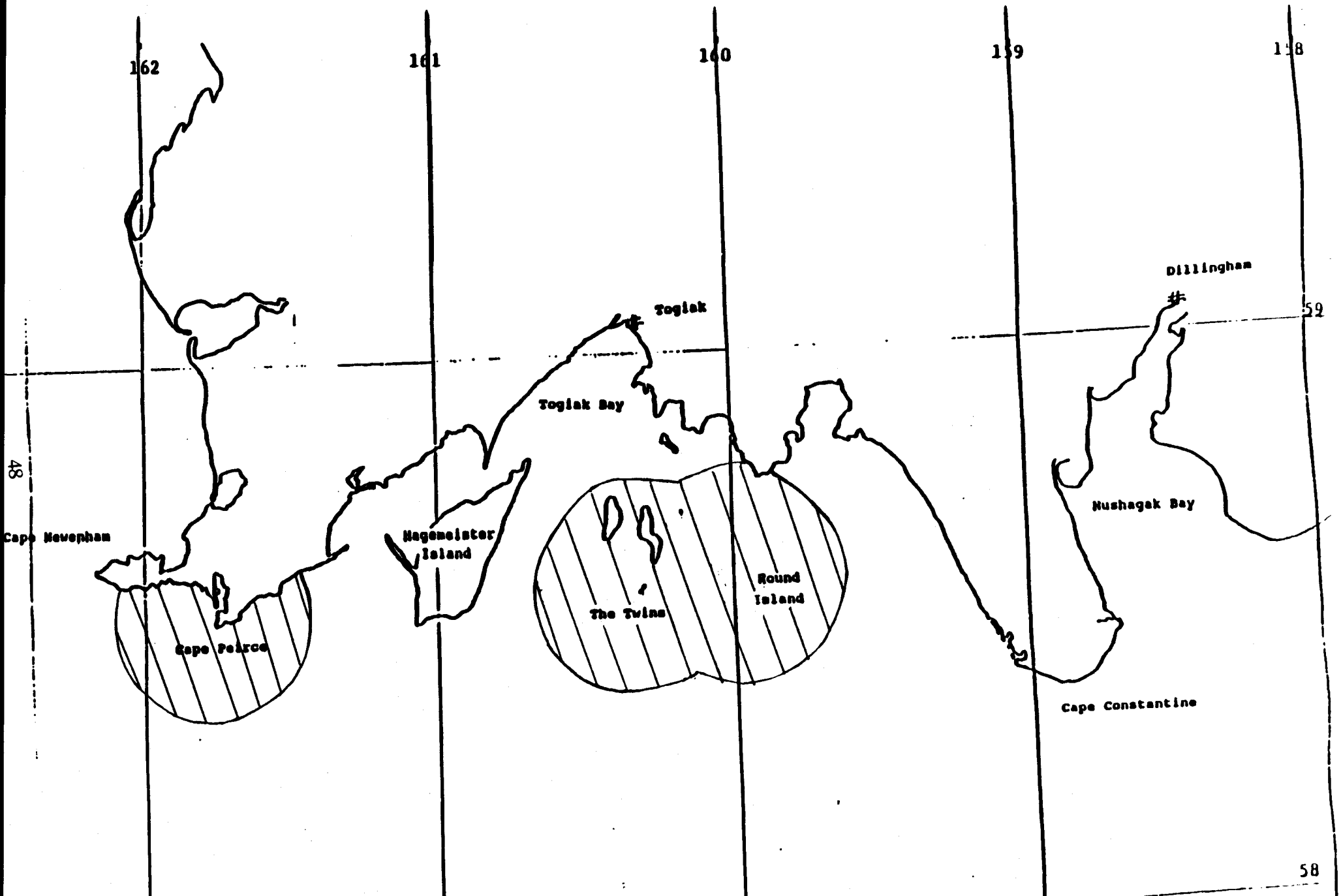


Figure 10 ALTERNATIVE 3 - Groundfish fishing closure from Cape Constantine to a twelve-mile perimeter around Cape Peirce. (Closure extends seaward from the State's three mile limit.)

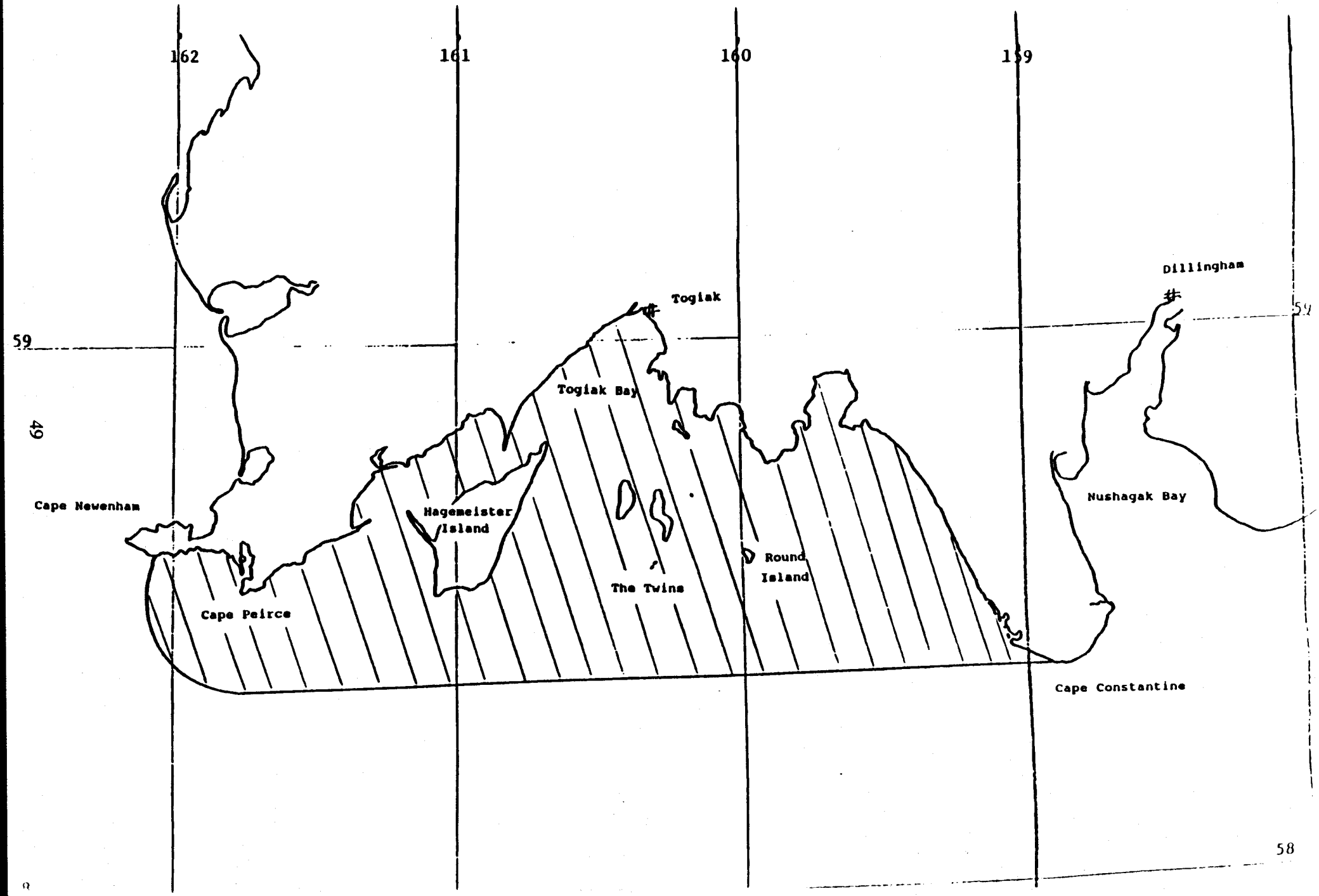


Figure A Togiak Herring Fishing District

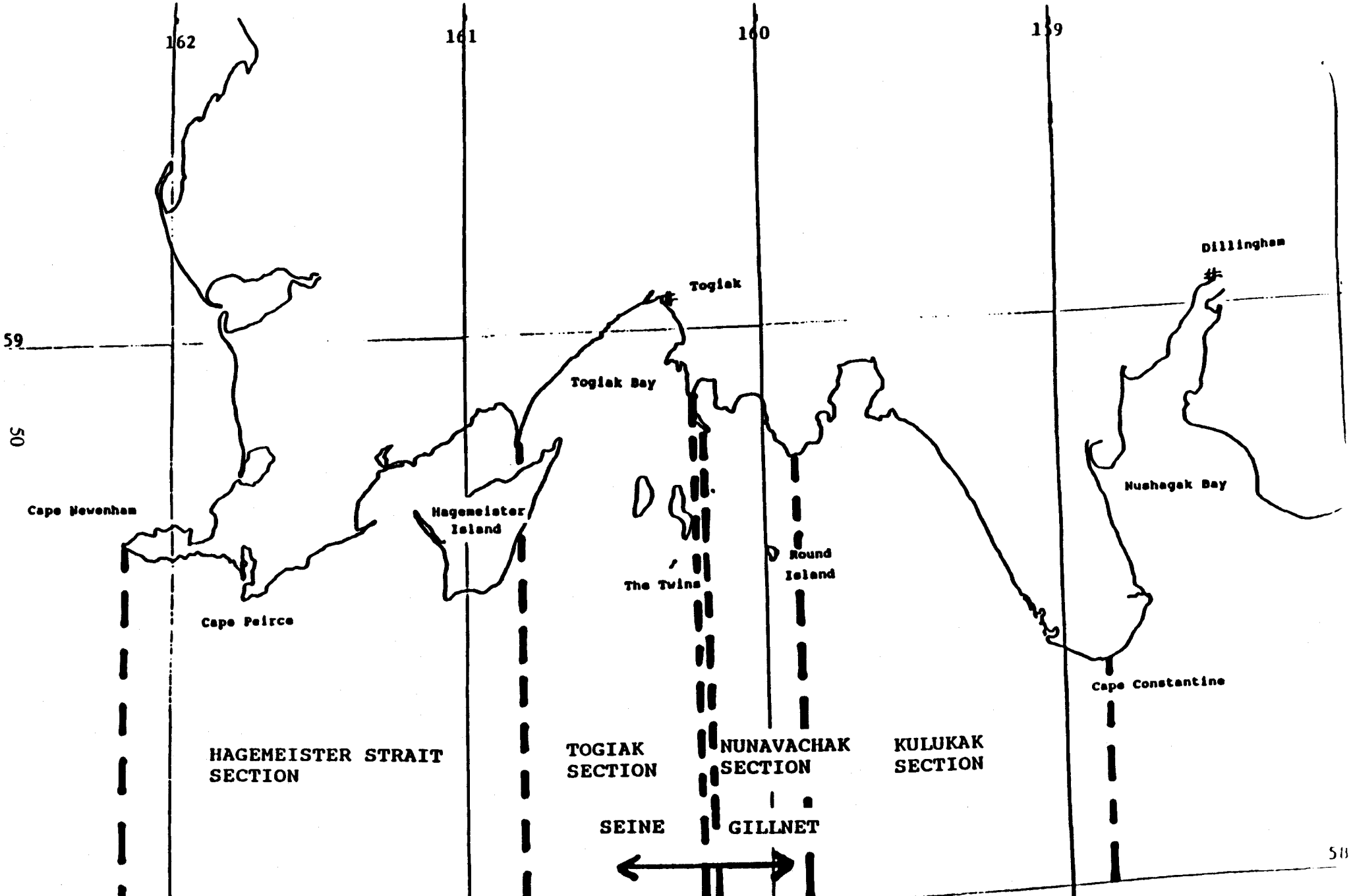
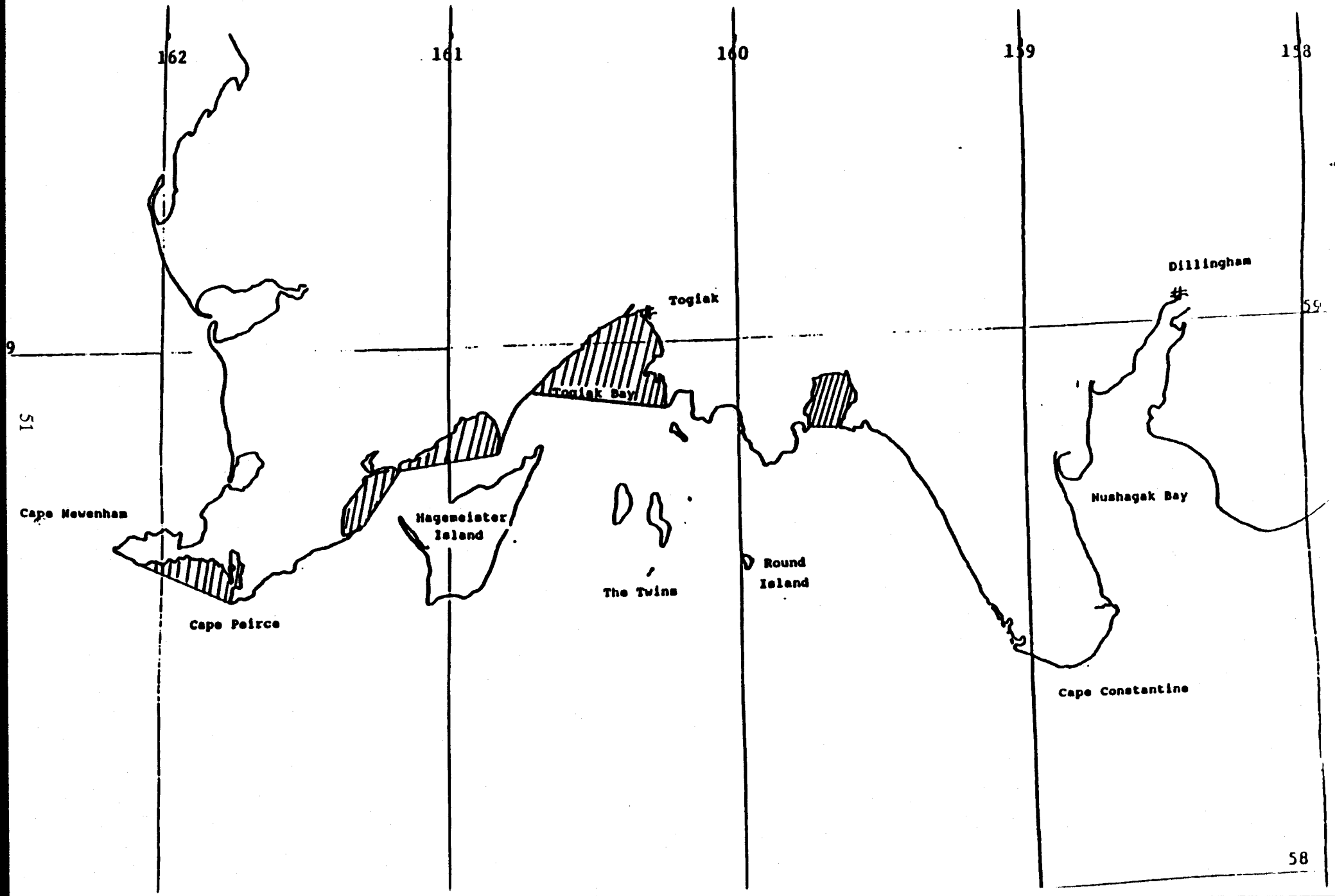


Figure B Togiak District Salmon Fishing Areas



4.0 RESCIND GULF OF ALASKA STATISTICAL AREA 68

4.1 Need for Action

An FMP amendment is proposed to delete the present East Yakutat District (Statistical Area 68) by combining it with the Southeast Outside District (Statistical Area 65). In 1980, the Eastern Regulatory Area in the Gulf of Alaska (Figure 1) was divided into the Yakutat District and the Southeast Outside District for purposes of sablefish management (45 FR 73486, November 5, 1980). In 1983, the Yakutat District was further divided into the West Yakutat District and the East Yakutat District, again for purposes of sablefish management (48 FR 43044, September 21, 1983).

Initial management experience during the 1984 sablefish fishery, however, indicated that the newly created East Yakutat District was not functioning as intended. Because the boundary (137° W. longitude) between the East Yakutat and the Southeast Outside Districts lies across a major fishing ground, catch reports could not be relied upon to separate catches between the two districts.

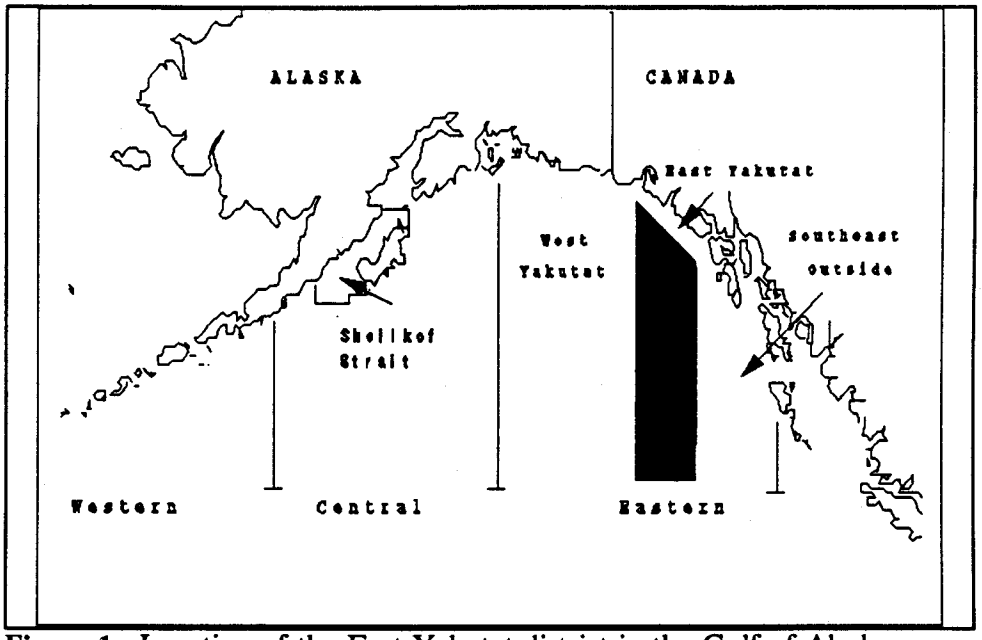


Figure 1. Location of the East Yakutat district in the Gulf of Alaska.

As a practical matter, NMFS has been managing the two districts as a single, combined district since 1984, even though two harvest quotas were established. The combined districts have been referred to as the Southeast Outside/East Yakutat District. Beginning in 1987, a single harvest quota has been specified for these combined districts (52 FR 785, January 9, 1987).

Fishermen, however, are required to maintain records by Federal Reporting Area, which is the same as a statistical area. Regulations at 50 CFR 672.2 identify Statistical Area 68 as the East Yakutat District. Fishermen are required to complete each day an additional sheet in the Daily Fishing Logbook for each reporting area they fish. If they fish in Area 68 and then fish in the Area 65 (Southeast Outside District), they must complete an additional sheet in the Daily Fishing Logbook

(DFL). Likewise, operators of processor vessels and managers of shoreside processing facilities who receives or processes groundfish from both reporting areas on the same day must complete an additional sheet in the Daily Cumulative Production Log (DCPL). Such reporting is necessary when harvest quotas are specified for each area. Because only one harvest quota is specified for the combined Southeast Outside/East Yakutat District, no useful information is obtained from the additional reports.

4.2 Alternatives

4.2.1 Alternative 1: Do nothing

Under this alternative, Statistical Area 68 would not be rescinded. Recordkeeping and reporting requirements would continue to apply to this area. Groundfish management would not be affected except for sablefish and demersal shelf rockfish (DSR). Other groundfish target species are managed as TAC categories specified for all of the Eastern Regulatory Area or all of the Gulf of Alaska. No changes in the area where the sablefish TAC applies would occur under this alternative, which would still apply to 132°40' - 140°W longitude, i.e., statistical areas 65 and 68 combined.

Under the FMP, the State of Alaska has primary management authority for DSR in the Eastern Regulatory Area. Its application applies to areas where a TAC is specified. To date, a DSR TAC has only been established for statistical area 65. In the areas to the west of 137°W longitude, any DSR is managed as "other rockfish." Under this alternative, application of the DSR TAC would continue to apply to the 132°40' - 137°, i.e., statistical area 65.

4.2.2 Alternative 2: Rescind Statistical Area 68.

Under this alternative, Statistical Area 68 would be rescinded by combining it with Statistical Area 65. No changes in sablefish management would occur. The TAC for DSR would extend westward three degrees of longitude.

4.3 Environmental impacts of the alternatives

4.3.1 Biological and environmental impacts

4.3.1.1 Alternative 1.

Under this alternative, Statistical Area 68 will be retained. No biological or environmental impacts would result, however.

4.3.1.2 Alternative 2.

Under this alternative, Statistical Area 68 will be rescinded. No biological or environmental impacts will result relative to Alternative 1.

4.3.2 Socioeconomic Impacts

4.3.2.1 Alternative 1.

Recordkeeping and reporting requirement would still apply to Statistical Area 68. If fishermen were to fish in Area 65 and then fish in Area 68 on the same day, they must complete an additional sheet

in the DFL. Likewise, processors receiving fish from both areas must complete an addition sheet in the DCPL.

The sablefish TAC would still apply to the same area between 132°40' and 140°W longitudes. The DSR TAC would continue to apply to the area between 132°40' and 137°W longitudes.

Industry costs

Fishermen and managers of processing facilities must comply with recordkeeping and reporting requirements. For purposes of the Paperwork Reduction Act, they are called "respondents". An estimated 5 minutes per respondent per day is required to complete each DFL sheet and each DCPL sheet.

The NMFS permit database shows 1,649 catcher and catcher/processor vessels are permitted to fish off Alaska in 1991 (through March 3, 1990). An estimated 124 vessels might actually fish between Areas 65 and 68 on the basis of vessel permits with Sitka telephone numbers. These are hook-and-line vessels that might participate in the sablefish fishery.

The sablefish fishery in the combined areas typically lasts 14 days. If each of 124 hook-and-line vessels fished in both areas each day, a total of 3,472 different sheets in the DFLs would be required to be completed, rather than 1,736 if the areas were combined. At 5 minutes per sheet, 289 hours would be expended by operators of these vessels in completing the sheets rather than about 145 hours. Any additional vessels that fish in Area 68 as well as in Area 65 would also be burdened.

Management and Consumer Costs

Management costs are those associated with enforcement personnel monitoring vessels' logbooks for two statistical areas if fishing has occurred in both areas. If recordkeeping and reporting burdens increase operational costs, these could be passed on to the consumer.

4.3.2.2 Alternative 2.

The sablefish TAC specified for the newly defined statistical area 65 would still apply to the same area as for alternative 1, i.e., between 132°40' and 140°W longitudes. The DSR TAC would apply to an additional 3° of longitude, i.e., from 132°40' - 137° to 132°40' - 140°.

Industry costs

Examples of recordkeeping and reporting costs estimated for Alternative 1 would be saved under this alternative. Sablefish management would not impose different impacts on the industry. Because the State of Alaska allows directed fishing for DSR with hook-and-line gear only, the trawl fleet could forego opportunity to harvest amounts of "other rockfish" by any amount of DSR attributed to the additional three degrees of longitude.

Management and Consumer Costs

Enforcement is simplified if redundant statistical areas are removed, because less detailed monitoring of logbooks is required. If reduced recordkeeping and reporting burdens reduce operational costs, these could be passed on to the consumer. The State of Alaska could incur some additional management costs to the extent that application of the DSR TAC would be extended from 137° to 140°.

5.0 ESTABLISH THE BOGOSLOF DISTRICT IN THE BERING SEA SUBAREA

5.1 Background

Pollock (Theragra chalcogramma) is the most abundant groundfish species in the eastern Bering Sea (EBS). The exploitable biomass (pollock aged 3 years and older) for 1991 over the continental shelf area of the EBS is estimated at 6.7 million metric tons (mt). An additional 405,000 mt is estimated for the Aleutian Islands subarea. Generally, the abundance of pollock in the EBS is characterized as high due to strong year classes in 1982 and 1984 but declining due to weaker year classes recruiting to the exploitable population since 1984.

The commercial harvest of pollock also dominates that of all other groundfish species. In 1990, about 1.4 million mt of pollock were caught in the Bering Sea and Aleutian Islands (BSAI)management area which amounted to about 77 percent of the total groundfish catch by U.S. fishermen in this area. This harvest was almost entirely processed by U.S. at-sea or shore-based processors. Only about 22,000 mt, less than two percent of the total 1990 catch, was processed by foreign at-sea processors working in joint ventures with U.S. fishermen. No joint venture processing has been authorized for the pollock fishery in 1991.

Common products made from pollock include frozen blocks, fillets, surimi, meal and roe. Pollock roe has the highest value, per mt. It is harvested from pre-spawning aggregations of pollock during the roe season from January through mid-April.

In 1990, the Council recommended and the Secretary approved, Amendment 14 to the FMP which, in part, provides authority to limit the amount of the total allowable catch (TAC) of pollock that is taken during the roe season (January 1 through April 15). For the 1991 fishing year, the Council has recommended that the roe-season fishery be limited to 441,500 mt which is 34 percent of the 1991 pollock TAC of 1.3 million mt for the Bering Sea subarea.

5.2 Need for Action

Separate TACs for pollock fisheries are specified for the Bering Sea and Aleutian Islands subareas of the BSAI management area. The Aleutian Islands subarea includes the U.S. EEZ that is north and south of the Aleutian Islands, west of 170° W. longitude, and south of 55° N. latitude. The Bering Sea subarea includes all remaining area of the U.S. EEZ in the Bering Sea. For management purposes, the Aleutian Islands subarea is reporting area 540 and the Bering Sea subarea includes all other reporting areas (Figure 1). Hence, the pollock TAC for the Bering Sea subarea applies to all fisheries in reporting areas beginning with 51, 52 and 53. The pollock TAC for the Aleutian Islands subarea applies to fisheries in reporting area 540.

The Bering Sea Pollock stock, however, does not distinguish itself along these management boundaries. Recent but incomplete biological data suggest that the pollock population on the EBS continental shelf is different from that in the deep water area known as the Aleutian Basin. The international waters, outside the fishery management jurisdiction of either the U.S. or the U.S.S.R., approximates the center of the Aleutian Basin. Age composition data indicate that Aleutian Basin pollock are generally older, and, at any specific age, generally smaller than those found on the continental shelf. Data also indicate that pollock in the Aleutian Islands subarea are generally different from either those in the Aleutian Basin or those on the continental shelf. Genetic studies and other biological assessments are continuing to determine the stock structure of Bering Sea pollock.

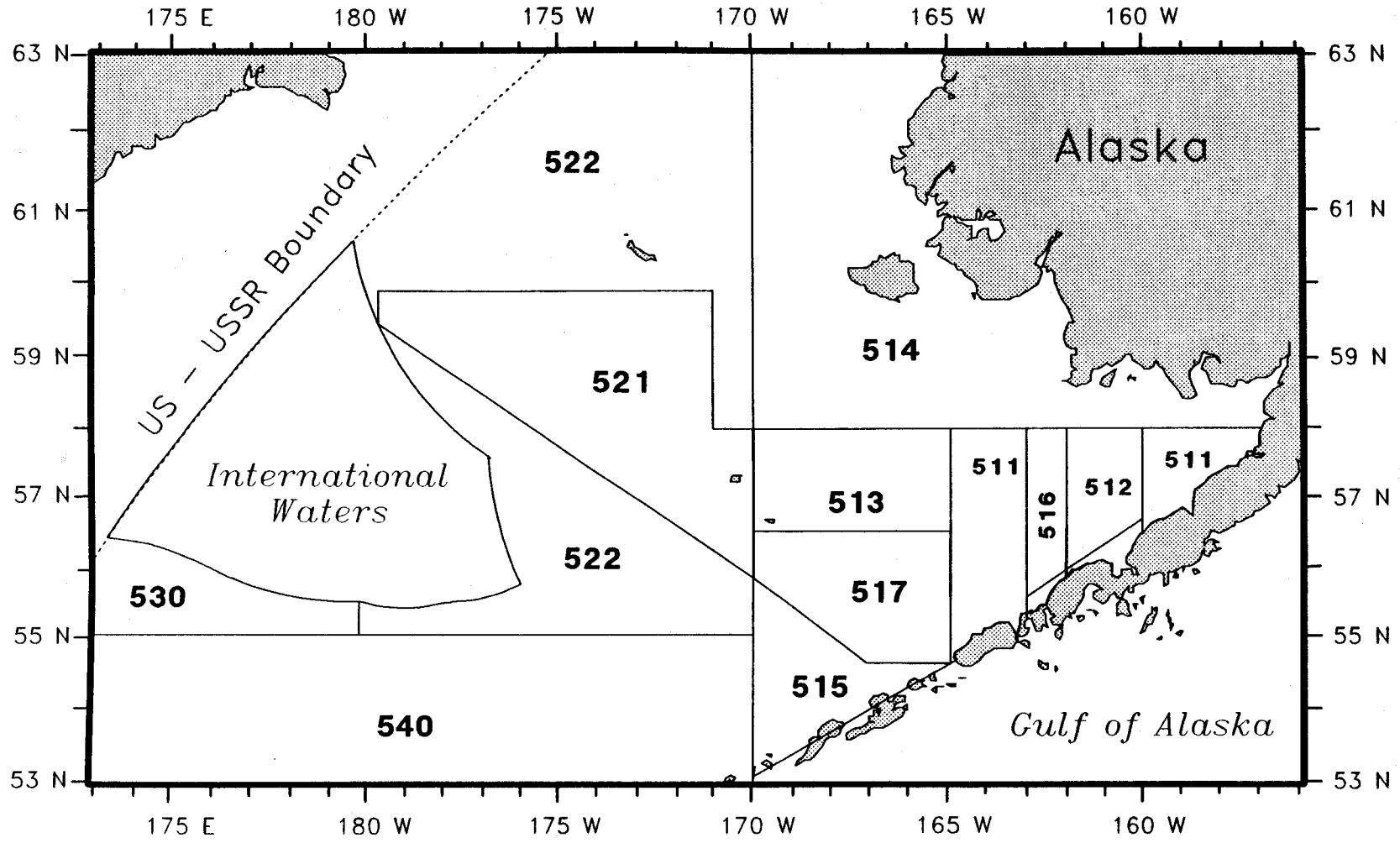


Figure 1. Regulatory and reporting areas of the Bering Sea and Aleutian Islands

The deep water of the Aleutian Basin is closest to the Alaska Peninsula in reporting area 515. The relatively flat plain of the continental shelf descends steeply down the continental slope and into the Aleutian Basin along the shelf break which extends generally in a northwest-southeast direction (roughly, the diagonal boundary of reporting areas 517 and 521). In reporting area 515, the shelf break curves sharply to the southwest toward the western Aleutian Islands. This area (515) is a principal spawning area for Aleutian Basin pollock.

Hydroacoustic surveys during the roe season in 1988 and 1989 in the vicinity of Bogoslof Island, near the center of reporting area 515, indicated an exploitable biomass of pollock of 2.4 million to 2.1 million mt. A survey was not done in 1990, but the 1989 estimate was projected to 1991 for purposes of the stock assessment and fishery evaluation report for 1991 (Council SAFE report, November, 1990). Assuming that natural mortality was the only source of loss between 1989 and 1991, the spawning stock in the Bogoslof area during the 1991 roe season was estimated to be 1.15 million mt. Preliminary results of a 1991 hydroacoustic-midwater trawl survey in the area indicate the spawning biomass to be 0.5 million mt or about half of the projected biomass.

Federal fishery scientists have been estimating the acceptable biological catch (ABC) in the Bogoslof area since 1988. Under current regulations implementing the FMP, however, pollock harvests in the Bogoslof or 515 area cannot be limited to the Bogoslof ABC because it is part of the larger Bering Sea subarea. For 1991, the Bogoslof pollock ABC was calculated to be 286,000 mt but for the continental shelf portion of the Bering Sea subarea the 1991 ABC is 1.7 million mt and the recommended TAC is 1.3 million mt. Biological surveys of the pollock biomass in the Bering Sea subarea have been limited to the EBS continental shelf, and have not included the Bogoslof pollock because they appear to be of a separate stock. Although the biomass and ABC estimates for pollock in the Bering Sea subarea are based on biological data pertinent only to the EBS continental shelf, they are applied for fishery management purposes also to area 515.

Aleutian Basin pollock are aggregated in the Bogoslof area from January through March prior to spawning and are vulnerable to intensive fishing by fisheries seeking the highly valued roe and other pollock products. In the absence of regulatory action, the TAC for roe-season pollock (441,500 mt in 1991) could be taken almost exclusively in area 515. Such concentrated pollock harvesting in the Bogoslof area could substantially exceed the ABC for this area. Although, this would not necessarily cause overfishing, as defined in the FMP, of the Aleutian Basin pollock population, it could severely threaten overfishing given the large international fishing fleet that also exploits these fish without limit in the international waters of the Bering Sea.

To prevent overharvesting of pollock in the Bogoslof area during the 1991 roe season, the Council recommended and the Secretary implemented an emergency interim rule (56 FR 5659). This action temporarily established a Bogoslof District and prescribed a catch limit in the district of 200,000 mt of pollock. The effect of this emergency rule expired on April 15, 1991. Expiration of this rule is not a problem for the remainder of the 1991 fishing year because Aleutian Basin pollock leave the Bogoslof area after spawning. The same management measures cannot be used in 1992 and future years, however, unless the FMP and its implementing regulations are amended through the normal rule-making process.

5.3 Alternatives

This assessment considers the following two alternative actions:

5.3.1 Alternative 1: No establishment of a Bogoslof District with area-specific management measures for pollock (status quo).

No amendment of the FMP and regulatory change would occur under this alternative. The entire Bering Sea subarea TAC allowance to the roe-season pollock fishery would be available on January 1 for harvest anywhere in that subarea, including the Bogoslof area. The Bering Sea subarea would close to directed fishing when the Director, Alaska Region, NMFS (Regional Director), determines that roe season allowance of pollock is harvested or on April 15, 1991, whichever comes first. Directed fishing for pollock would resume on June 1, 1991 for the pollock TAC remaining uncaught at the time.

5.3.2 Alternative 2: Establishment of a catch limit for pollock in the Bogoslof area could be accomplished in two ways. Either (1) a unique Bogoslof District could be created for which a pollock TAC, separate from the Aleutian Islands subarea and the Bering Sea subarea, would be annually specified, or (2) a pollock catch limit specific to the Bogoslof District could be established as a subdivision of the pollock TAC for the Bering Sea subarea.

The Bogoslof District under both options would be defined as new reporting area 518 which is that part of reporting area 515 that is west of 167° W. longitude (Figures 2 and 3). A new reporting area, 519, would therefore be created as that part of area 515 that is east of 167° W. longitude. Fishing for pollock in new reporting area 519 and in other reporting areas of the Bering Sea subarea would be unaffected by any closure of the Bogoslof area to fishing for pollock due to attainment of the Bogoslof pollock TAC. Fishing for other species of groundfish in the Bogoslof District also would be unaffected.

5.3.2.1 Option 1: The FMP would be amended under option 1 to define a Bogoslof District as distinct from the Bering Sea subarea for purposes of managing the pollock fishery. Annual estimation of the pollock exploitable biomass, ABC and other biological parameters would be required for the Bogoslof District separate from either the Aleutian Islands or Bering Sea subareas. The Council would annually recommend a TAC for pollock in the Bogoslof District within the optimum yield range for groundfish fisheries in the BSAI area. The Bogoslof pollock TAC would be apportioned between roe and non-roe fishing seasons as currently provided under Amendment 14 for the Bering Sea and Aleutian Islands subareas.

5.3.2.2 Option 2: Under option 2, the Bogoslof District would remain as part of the Bering Sea subarea. Annual estimation of the pollock exploitable biomass, ABC and other biological parameters would be done for the Bering Sea subarea as it is now. The Council and the Secretary would then approve and implement a Bogoslof pollock roe season catch limit that would be part of the larger roe season allowance of the Bering Sea subarea pollock TAC. Regulations affecting the commercial pollock fishery would be changed under this option to provide authority to the Regional Director to prohibit directed fishing for pollock in the Bogoslof area when he determines that the specified Bogoslof portion of the Bering Sea subarea TAC is harvested. This would make option 2 work the same as the 1991 Bogoslof emergency rule.

The practical effect on the pollock fishery under each option is likely to be the same. Both options provide for closure of the Bogoslof District to the pollock fishery during the roe season independent

of a closure in the Bering Sea subarea. Hence, the assessment of potential environmental impacts does not distinguish the options; only the alternatives.

The policy choice between Options 1 and 2 depends on the need for conservation of pollock in the Bogoslof District during the non-roe season. Aleutian Basin pollock are currently understood to leave the Bogoslof area after spawning. However, this area is not normally surveyed during the routine summer (non-roe season) survey of the EBS shelf. Hence, there are no scientific data to indicate whether pollock harvested from the Bogoslof area during the non-roe season are primarily of the EBS shelf stock or the Aleutian Basin stock. Option 2 would be a rational choice if the latter is true, and option 1 if the former is true. Pollock catch data in 1989 and 1990 indicate substantial catches of pollock from reporting area 515. In 1989, 82 percent of the pollock harvested from within reporting area 515 was taken during the third and fourth quarters of the year. This proportion decreased to 27 percent during the same quarters of 1990. The extent to which these catches were made east and west of 167° W. longitude, however, is not apparent from the data.

5.4 Potential Environmental Impacts of the alternatives

Environmental impacts on the quality of the human environment are discussed below as potential socio-economic, physical, and biological impacts.

5.4.1 Socio-economic impacts. Alternative 1 would allow the groundfish fishery to focus effort on pre-spawning aggregations of pollock until the entire roe season allowance is harvested. Fishing costs are reduced when the target species is aggregated because the catch per unit of effort is increased relative to fishing on a dispersed school of fish. Production of pollock roe, the highest valued pollock product, will be constrained to some extent by the roe-stripping limitations of Amendment 14 to the FMP which was implemented on January 1, 1991 (56 FR 492, Jan. 7, 1991).

Under Alternative 2, roe production will be as constrained by Amendment 14 as it is under Alternative 1, however, other direct and indirect costs will likely be imposed on the fishery under Alternative 2. This is based on an economic assumption that imposing a requirement on a profit-maximizing fishing operation to change its behavior will increase its costs or reduce its revenues or both. If this assumption were incorrect, then the fishing operation already would be behaving in the desired manner and there would be no need to impose a requirement to change. The magnitude and distribution of costs imposed by a new regulatory requirement will vary directly with the severity of the restriction.

Current data on the operating costs of fishing vessels are insufficient to quantitatively estimate the magnitude and distribution of direct costs to the pollock fishery and indirect costs to other fisheries of implementing Alternative 2. Instead, some potential costs are qualitatively described.

Some cost to fishing operations would occur from being prevented from fishing the most productive schools of pollock in the Bogoslof area by its closure to the pollock fishery when the Bogoslof District pollock TAC is attained. Such a closure would force pollock operations to fish potentially less aggregated or less desirable schools of pollock outside the Bogoslof District. This would change the distribution of gross revenues due to increased crowding in areas remaining open to pollock fishing. Other indirect costs could be imposed on fisheries for other species if a redistribution of fishing effort under Alternative 2 causes an increase in the bycatch of species such as salmon and herring. Because the fishery is not expected to forgo any of its roe-season allocation of the pollock TAC under Alternative 2, the only potential immediate cost may result from reduced catch per unit of effort in

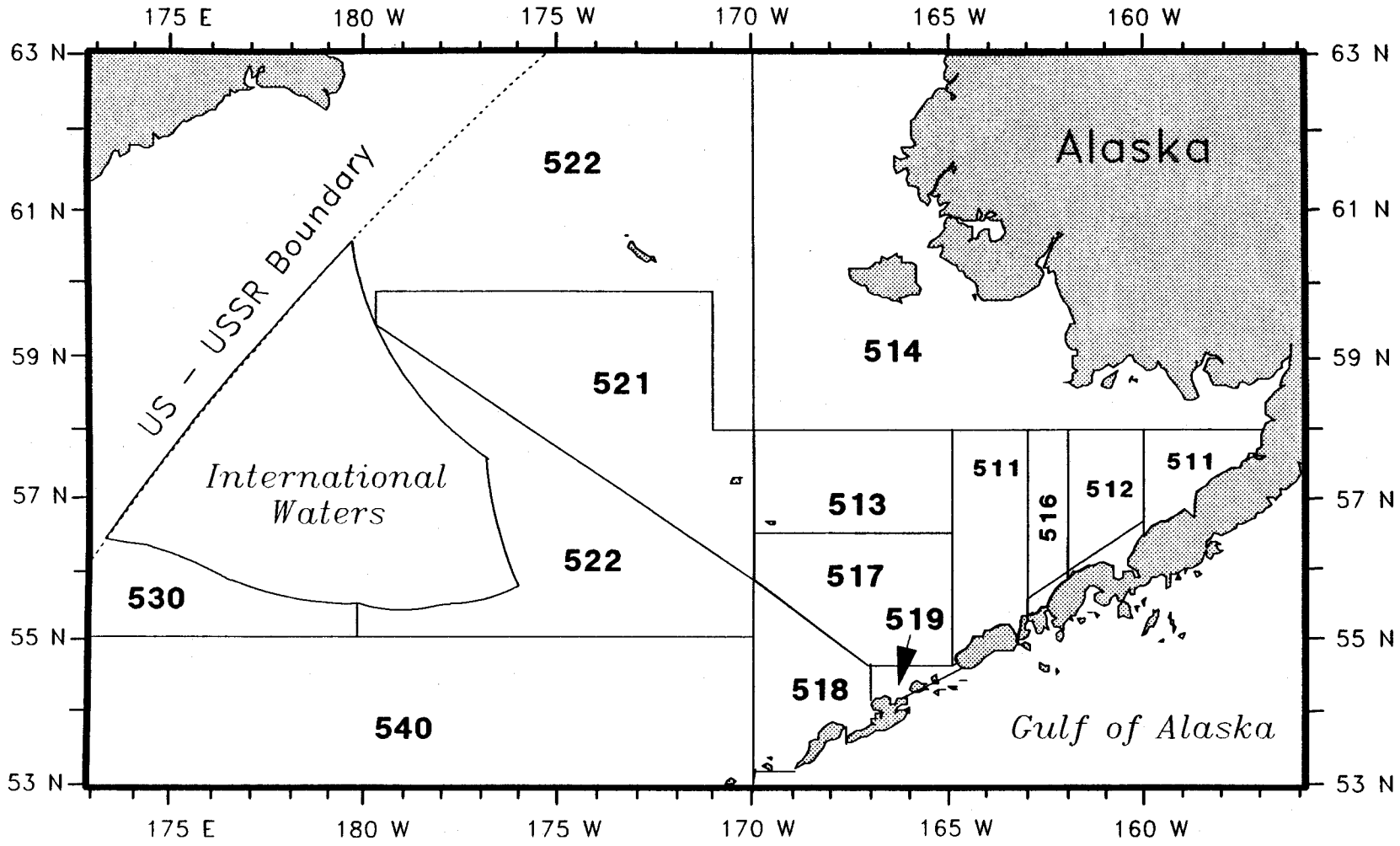


Figure 2. Proposed Bogoslof District (Area 518)

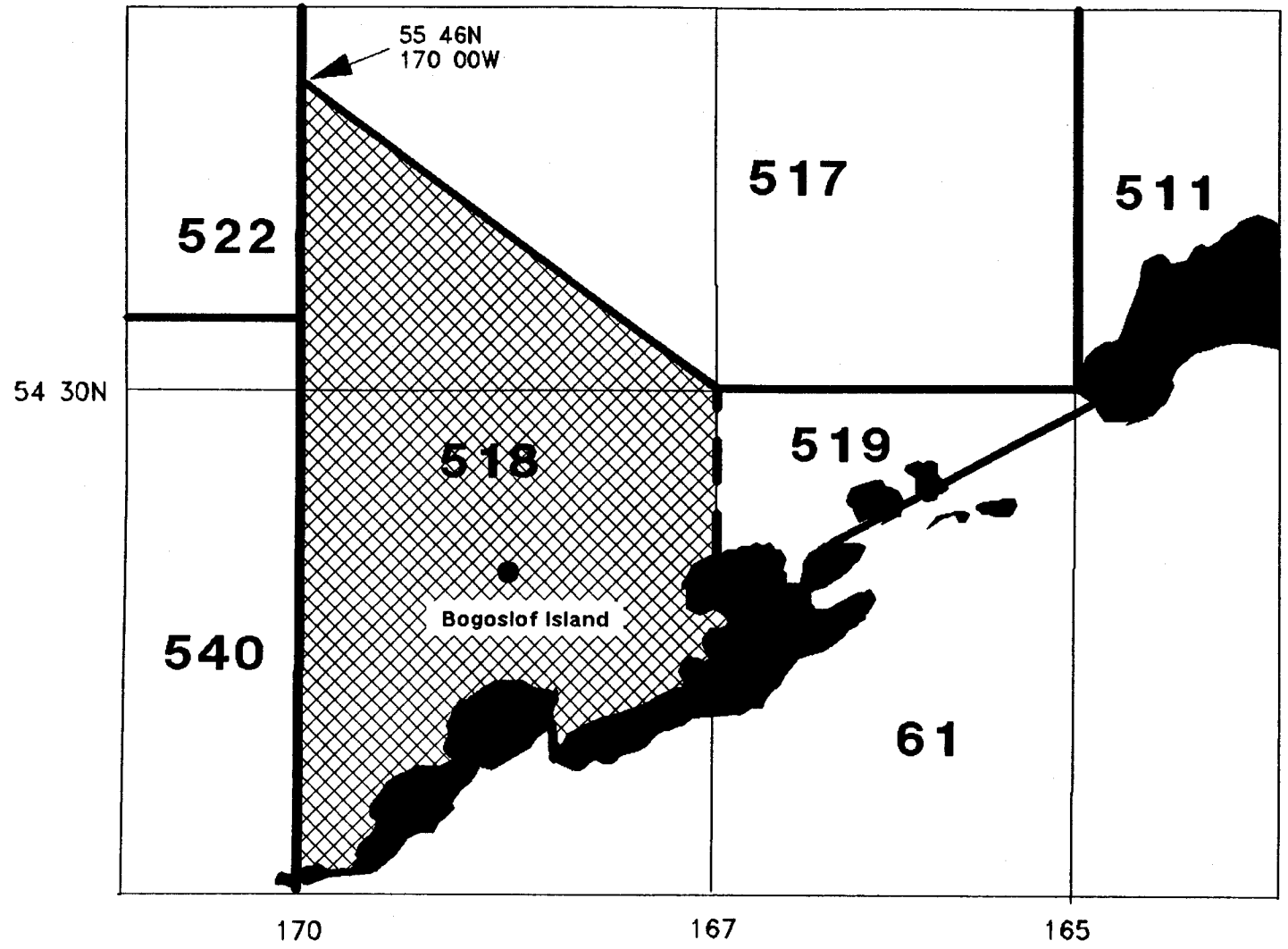


Figure 3. Bogoslof District (518)

areas outside of the Bogoslof District. These costs are expected to be minimal and likely will not result in a measurable increase in the price of pollock products for consumers.

Potentially increased operating costs, however, may be balanced in the long term by increased future pollock harvests resulting from conservation of pollock under Alternative 2. This potential benefit also cannot be estimated with available information. Any conservation benefit to the pollock fishery, however, will likely be dissipated by increased fishing capacity in the absence of effective control on its growth. In addition, the realization of a conservation benefit is somewhat dependent on collateral controls on fishing in the international waters of the Bering Sea to which the Bogoslof spawning stock is assumed to return after spawning.

5.4.2 Physical impacts. No physical impacts on the environment are anticipated under either alternative. The operation of trawl gear in the pollock fishery during the roe season is such that the gear rarely comes in contact with the sea bottom. Neither alternative would affect the amount of pollock that would be harvested during the non-roe season because this amount is determined under Amendment 14. Pollock fishing in the Bogoslof District later in the year with bottom-tending trawl gear is not expected because of insignificant amounts of pollock in the area after the roe-season spawning aggregations leave in the spring.

5.4.3 Biological impacts: Alternative 1. Alternative 1 would allow up to the entire roe-season allowance (441,500 mt in 1991) to be harvested from the pollock gathered to spawn in the vicinity of Bogoslof Island. This could exceed the ABC for pollock from this stock and could reduce the biomass to a level that results in overfishing. The ABC for this stock may already be exceeded by the large, uncontrolled fishery in international waters of the Bering Sea. Uncertainty over the size of the Aleutian Basin pollock population prevents a precise determination of the amount of fishing mortality that would produce overfishing.

Pollock harvests from the international waters of the Bering Sea are currently estimated to be about 1.5 million mt per year. For this amount of fishing mortality to be an acceptable biological catch, a biomass of over 5 million mt of pollock would be required. Additional pollock harvests in the deep-water areas of the respective EEZs of the U.S. and U.S.S.R. would further increase the biomass necessary to support the total fishing mortality at a sustainable level.

Although no single survey has covered the entire Aleutian Basin, the substantial portions of the deep water surveyed have produced estimated pollock biomass levels of 3.1 million mt in 1987 (based on survey of U.S.S.R. and international deep water areas), 2.4 million mt in 1988, and 2.1 million mt in 1989 (based on survey of U.S. and international deep water areas). If these biomass estimates represent the majority of the pollock biomass present in the Aleutian Basin at any time, the current total fishing mortality of the Aleutian Basin pollock stock may be excessive.

5.4.4 Biological impacts: Alternative 2. Alternative 2 would constrain the harvest of Aleutian Basin pollock in the U.S. deep water area near Bogoslof Island during the roe season. This would decrease the risk of overfishing the Aleutian Basin stock. Reducing the risk of overfishing will assist in maintaining future biomass levels (and catch levels) of Aleutian Basin pollock higher than they would be in the presence of overfishing. The roe season is the critical period for reducing the risk of overfishing since Aleutian Basin pollock appear to disperse out of the Bogoslof Area after the roe season and, as a result, cease to be targeted by the pollock fishery in the U.S. EEZ.

Management under Alternative 2 will not necessarily assure that overfishing Aleutian Basin pollock will be prevented. The pollock spawning in the Bogoslof area appear to be primarily the result of

large year-classes on the EBS shelf and possibly the Siberian shelf populations. Available data indicate that most of the fish harvested in the Aleutian Basin and the Bogoslof area are from the strong 1972 and 1978 year-classes, although weaker year-classes also are present. Preliminary results suggest that some pollock are recruiting to the Basin from the 1982 year-class which is the most recent strong year class. Therefore, the Aleutian Basin appears to be an "overflow area" for strong recruitment in the shelf populations and the abundance of pollock in the Basin likely undergoes large long-term shifts in abundance. With the current unregulated fishery in the international waters and a lack of sustained recruitment to the Aleutian Basin population, it is unlikely that pollock catch limits in the Bogoslof District by themselves will preserve the spawning stock in this area or the international waters.

5.4.5 Effects to Marine Mammals

Substantial declines in abundance of North Pacific Ocean Steller sea lion (Eumetopias jubatus) and harbor seal (Phoca vitulina) populations have been observed over the last two decades. Presently, the cause or causes of these observed population reductions are unknown. NMFS permanently listed the Steller sea lion as a threatened species on November 26, 1990, and established emergency protective regulations to aid the species's recovery (55 FR 49204).

Reduced food availability is considered to be a possible factor in the Steller sea lion and harbor seal declines. Pollock appears to be an important prey item for both of these pinniped species. Large fishery harvests of pollock, particularly over small areas and time periods, may decrease the amount of food available to Steller sea lions and harbor seals. However, the actual effects of pollock fishing on the foraging success of these species are unknown.

Because neither alternative, of itself, will change pollock fishing distribution or harvest levels, adoption of either alternative is not likely to have any effect on Steller sea lions or harbor seals. However, alternative 2 will establish a framework for improved management of pollock roe fisheries around Bogoslof Island, and therefore, may benefit Steller sea lions and harbor seals.

Commercial pollock fisheries are not expected to adversely affect any of the cetacean species present within the Bering Sea. Thus, neither of the alternatives under consideration is anticipated to have any effect on cetaceans.

Endangered Species Act

On April 19, 1991, the NMFS completed formal Section 7 Consultation on the Bering Sea and Aleutian Islands FMP and its fishery. The biological opinion issued for that consultation concluded that the FMP and fishery are not likely to jeopardize the continued existence and recovery of any endangered or threatened species under the jurisdiction of the NMFS.

Adoption of either of the alternatives will not affect listed species in a way that was not already considered in the subject biological opinion. Implementation of Alternative 2, with subsequent limitation of pollock harvest around Bogoslof, may benefit Steller sea lions.

6.0 CHANGE FISHING GEAR RESTRICTIONS IN THE GULF OF ALASKA AND BERING SEA/ALEUTIAN ISLANDS.

6.1 Description of the problem and need for Action.

Amendments 16 and 21 to the Groundfish Fishery Management Plans (FMPs) for the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) established Federal criteria for groundfish pots that overlap with the State of Alaska's definition for king crab pots. This has caused confusion over the ability of enforcement personnel to prohibit the use of king crab pots that also meet the Federal criteria for groundfish pots during closed seasons for king crab in the EEZ. The criteria are also inconsistent with the State's regulations which specifically prohibit the use of king and Tanner crab pots for taking groundfish.

Action is required to clearly differentiate between groundfish pots that may be used in the Federally managed groundfish fishery, and crab pots used in fisheries managed by the State of Alaska, as well as to achieve consistency between State and Federal regulations for groundfish pots.

Current Federal groundfish regulations state that:

> Each pot used to fish for groundfish must be equipped with rigid tunnel openings that are no wider than 9 inches and no higher than 9 inches, or soft tunnel openings with dimensions that are no wider than 9 inches. (USC 672.24(b)(2) and USC 675.24(b)(2))

while the relevant Alaska Codes are:

> 5AAC 28.050. GEAR FOR GROUNDFISH.
> (a)(1) King and Tanner crab pots as defined in 5AAC 34.050(f) and 5AAC 35.050(e) may not be used to take groundfish;
>
> 5AAC 34.050. GEAR FOR KING CRAB.
> (f) A king crab pot is a pot with rigid tunnel eye openings which are a minimum of five inches in one dimension and tunnel eye opening perimeters which individually are larger than 30 inches, or a pot which tapers inward from its base to a top consisting of one horizontal opening of any size.
>
> 5AAC 35.050. GEAR FOR TANNER CRAB.
> (e) A Tanner crab pot is a pot with rigid tunnel eye openings which individually are a maximum of five inches in one dimension and tunnel eye opening perimeters which individually are larger than 30 inches, or a pot which tapers inward from its base to a top consisting of one horizontal opening of any size.

From the regulations, it is apparent that a pot cannot meet the Federal criteria for a groundfish pot as well as the State definition of a Tanner crab pot. That is, if the tunnel eye opening is a maximum of 5 inches in one dimension (State definition) and 9 inches in the other dimension (Federal criterion), then it cannot have a tunnel eye opening perimeter greater than 30 inches. Amending the Federal regulations to limit groundfish pot tunnel opening perimeters to no more than 30 inches would clearly differentiate between groundfish and king crab pots, as would amending the State definition of king crab pots to require tunnel eye perimeter openings of greater than 36 inches.

6.2 The Alternatives.

6.2.1 Alternative 1: Do nothing - maintain the status quo.

Adoption of this alternative would maintain current pot gear criteria in the two groundfish FMPs and preserve the overlap with the State of Alaska's definition of king crab pots.

6.2.2 Alternative 2: Amend the Federal regulations to require that groundfish pot tunnel opening perimeters individually measure no more than 30 inches.

Adoption of this alternative would differentiate between pots that are used in the federally-managed groundfish fishery and king crab pots as defined by Alaska Code. A revised regulation might read:

> Each pot used to fish for groundfish must be equipped with rigid tunnel openings that are no wider than 9 inches, or soft tunnel openings with diameter no greater than 9 inches when opened as a circle, except that the individual tunnel opening perimeters may not measure greater than 30 inches.

Such a definition would allow some flexibility in determining the shape of groundfish pot tunnel openings while preserving the distinction from king crab pots.

6.2.3 Alternative 3: Request that the State of Alaska amend it's regulations to require king crab pot individual tunnel eye opening perimeters to be greater than 36 inches.

Adoption of this alternative would not directly eliminate the overlap in criteria for groundfish and king crab pots nor would it achieve consistency between State and Federal groundfish regulations. However, it would serve notice to the State that the Council considers the best solution to the problem to be a change in State regulations.

6.2.4 Alternative 4: Institute a registration system whereby pots would be registered as fish or crab pots and identified as such with a metallic tag.

Such a system would adequately differentiate a groundfish pot from a king crab pot. However, to the extent that some fishermen may use their pots to fish for both target species at different times, this would require them to maintain separate pots or to retag their pots during the year.

6.3 Biological and environmental impacts of the alternatives.

Differences in biological and environmental impacts among the alternatives are not likely to be detectable in the near term. As a practical matter, there is not much opportunity to legally fish pots that meet the definitions for both groundfish and king crab pots (Alternative 1). Any groundfish pot fisherman delivering fish in Alaska may not use crab pots to fish for groundfish. In addition, king crab pots may not be left in the water in a fishing condition when the king crab season is closed. Thus, the only fishermen legally fishing groundfish pots that also meet the definition of king crab pots would be those fishing for groundfish outside state waters during an open king crab season and landing the fish outside the state. Such occurrences have not been identified in the available data. De facto industry practice has, apparently, most closely approximated Alternative 2.

Data are not available to evaluate definitively the difference in bycatch rates of crab and halibut between pots with eye opening perimeters of 30 inches (Alternative 2) and those with 36 inches

(Alternative 3). A large number of sample observations would likely be required to identify a statistically significant difference. In a study to evaluate the effectiveness of modified crab pots for increasing cod catch and decreasing halibut and crab bycatch, Carlile et al found that increasing the number of dividers in the tunnel eye hole (decreasing individual eye hole perimeters) resulted in an apparent (but not statistically significant) increase in cod catch and decrease in halibut bycatch. (Not enough crab were caught to develop statistics on crab bycatch.) Comparing treatments without fish retention devices, the study showed that tunnel eye openings of 8" X 7" caught and retained more cod than tunnel eye openings of 8" X 11.5", 8" X 18" or 8" X 36", and had the lowest halibut bycatch. To the extent that smaller tunnel eye openings result in lower bycatches of halibut (and, possibly, crab), then Alternative 2 would seem preferable in terms of biological impact.

Alternative 4, which would require registration and tagging of pots, would result in no foreseeable biological or economic impacts.

6.4 Socioeconomic impacts of the alternatives.

Alternative 1, the status quo, would involve no change in industry costs and returns or in management costs. Any inefficiencies and social dysfunctions attributable to confusion over enforcement authority resulting from overlapping definitions for king crab and groundfish pots, or inconsistency between State and Federal groundfish regulations, would persist. Adopting Alternative 2 or 3 would eliminate these inefficiencies and social dysfunctions, and could involve small changes in industry costs and returns.

If all groundfish pots had been modified to have 9" X 9" openings (36" perimeters), then adopting Alternative 2 would require further modification and an increase in industry costs. In amendments 21 and 16 to the GOA/BSAI FMPs, the costs of modifying pots by inserting three dividers into a rigid 9" X 36" opening to create four 9" X 9" openings, was estimated to be $525 per vessel, principally labor costs. Assuming that pots must be completely remodified and that to insert two additional dividers so as to create six 9" X 6" openings would increase costs by two-thirds, then costs would increase by $350 to a total of $875 per vessel. As of February 26, 1990, there were 61 vessels licensed to use groundfish pots (personal communication, Ron Berg, NMFS) indicating that the total costs of pot modification might be as high as $53,375. To the extent that the smaller openings may result in higher cod catch rates (Carlile, et al), there could be additional industry revenues to offset these costs. However, to the extent that industry practice already approximates compliance with Alternative 2, there would be smaller increases in industry costs and revenues. As noted in the discussion of biological impacts above, there is not much opportunity to legally fish pots that meet the definitions for both groundfish and king crab pots, and present industry practice is believed to be close to Alternative 2.

Adopting Alternative 3 would involve no increase in costs to the groundfish industry. To the extent that the king crab industry employs traps with tunnel eye openings less than 36", there could be a cost of trap modification to the king crab fleet if the State were to change it's regulations. If, as noted in Carlile, et al, a "standard" king crab pot has tunnel eye openings of 9" X 36", then adopting Alternative 3 would not require gear modification by the king crab industry. Assuming the State acted on the Council's recommendation, then the economic inefficiencies and social dysfunctions occasioned by the status quo would be ameliorated. However, there would be some economic cost to the State of initiating and implementing a regulatory change. Depending on the attitudes and perceptions of the State's managers as to the source of the problem of overlap in Federal groundfish pot criteria and State king crab pot definition, the recommendation implicit in Alternative 3 could

be the cause of social dysfunction in the Federal/State management relationships and loss of efficiency in subsequent cooperative management endeavors.

Alternative 4, requiring registration and tagging of pots has the potential to result in considerable administrative burdens. The March 1991 Westward Region Shellfish Report (Alaska Department of Fish and Game) estimates the number of king crab pots used in the Bristol Bay area at over 68,000. The logistics of registering and tagging this number of pots, in addtion to several thousand groundfish pots, would be considerable. Administrative costs to federal and state agencies, as well as potential costs to the fleet, are not quantifiable at this time but would likely be significant. The extent of the problem being addressed by this amendment would probably not justify such costs in light of the other alternatives available.

6.5 Reference

Carlile, David, Tom Dinnocenzo and Leslie Watson. "An Evaluation of the Effectiveness of Modified Crab Pots for Increasing Catch of Pacific Cod and Decreasing Catches of Halibut and Crab." Contract report prepared for Alaska Fisheries Development Foundation. Alaska Department of Fish and Game, Juneau. March, 1991.

7.0 EFFECTS ON ENDANGERED SPECIES AND ON THE ALASKA COASTAL ZONE

None of the alternatives would constitute actions that "may affect" endangered species or their habitat within the meaning of the regulations implementing Section 7 of the Endangered Species Act of 1973. Thus, consultation procedures under Section 7 on the final actions and their alternatives will not be necessary.

Also, for the reasons discussed above, each of the alternatives would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Management Program within the meaning of Section 307(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

8.0 OTHER EXECUTIVE ORDER 12291 REQUIREMENTS

Executive Order 12291 requires that the following three issues be considered:

(a) Will the amendment have an annual effect on the economy of $100 million or more?

(b) Will the amendment lead to an increase in the costs or prices for consumers, individual industries, Federal, State, or local government agencies or geographic regions?

(c) Will the amendment have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S. based enterprises to compete with foreign enterprises in domestic or export markets?

Regulations do impose costs and cause redistribution of costs and benefits. If the proposed regulations are implemented to the extent anticipated, these costs are not expected to significant relative to total operational costs.

The amendment will not have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S. based enterprises to compete with foreign enterprises in domestic or export markets.

The amendment should not lead to a substantial increase in the price paid by consumers, local governments, or geographic regions since no significant quantity changes are expected in the groundfish markets. Where more enforcement and management effort are required, costs to state and federal fishery management agencies will increase.

This amendment should not have an annual effect of $100 million, since although the total value of the domestic catch of all groundfish species is over $100 million, this amendment is not expected to substantially alter the amount or distribution of this catch.

9.0 IMPACT OF THE AMENDMENTS RELATIVE TO THE REGULATORY FLEXIBILITY ACT

The Regulatory Flexibility Act (RFA) requires that impacts of regulatory measures imposed on small entities (i.e., small businesses, small organizations, and small governmental jurisdictions with limited resources) be examined to determine whether a substantial number of such small entities will be significantly impacted by the measures. Fishing vessels are considered to be small businesses. A total of 1,348 vessels may fish for groundfish off Alaska in 1990, based on Federal groundfish permits issued by NMFS through March 29, 1990. While these numbers of vessels are considered substantial, regulatory measures will only affect a smaller proportion of the fleet.

10.0 FINDINGS OF NO SIGNIFICANT IMPACT

For the reasons discussed above, neither implementation of the status quo nor any of the alternatives would significantly affect the quality of the human environment, and the preparation of an environmental impact statement on the final action is not required by Section 102(2)(c) of the National Environmental Policy Act or its implementing regulations.

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